AVIATION WEEK

A McGRAW-HILL PUBLICATION

DEC. 20, 1954

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Lend a hand... the target in the filter center "action indicator ring" could be your city... dependent on Air Force interceptors like Convair's delta wing F-102's to destroy a (1) high (H), multi-engine (M), enemy bomber reported approaching on an unerring track (9).

Lend a hand for your own defense. Be a civilian volunteer. Serve with the Ground Observer Corps at local observation posts or filter centers.

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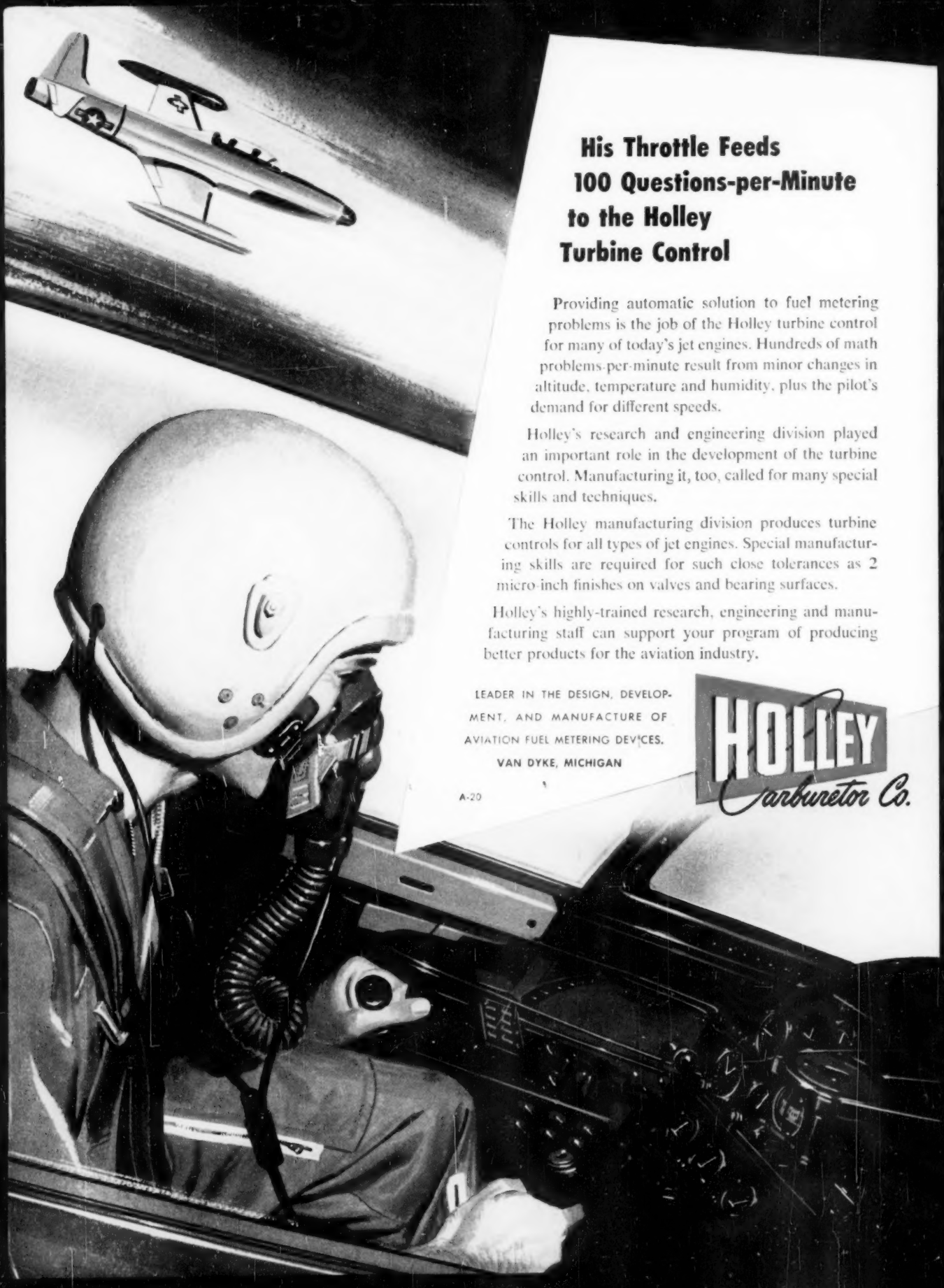

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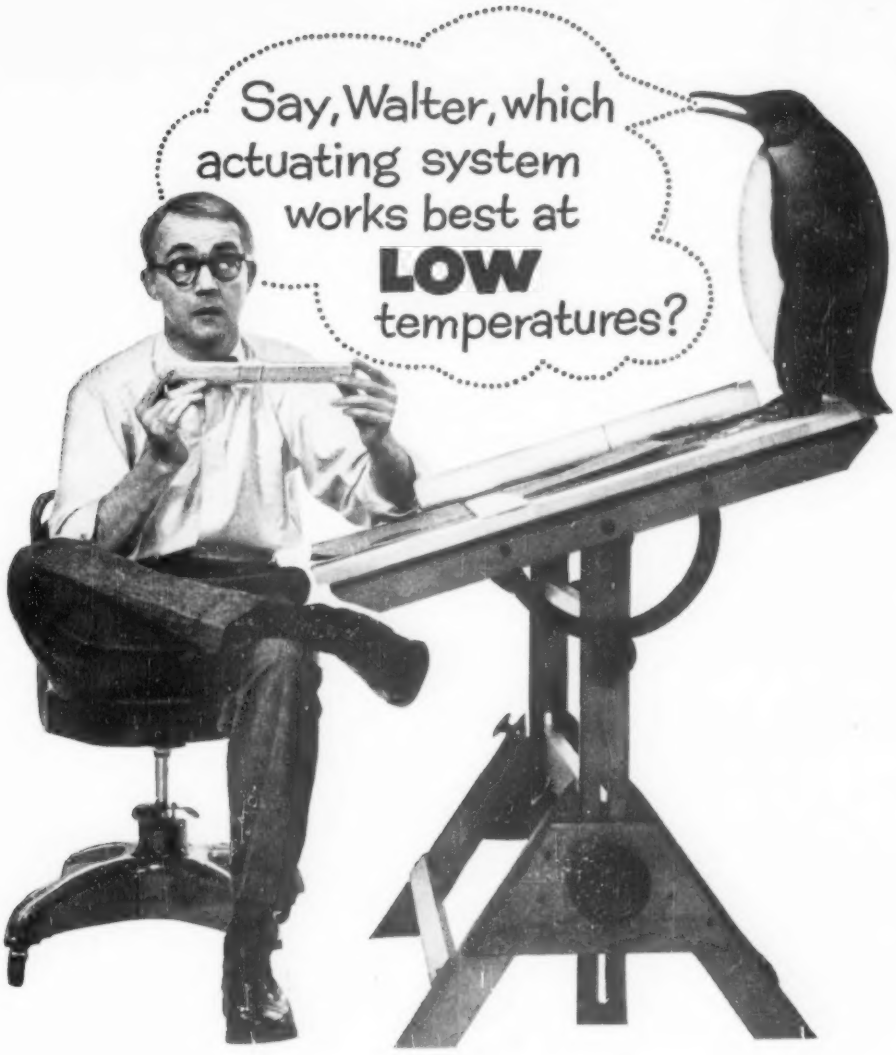

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Phillips 66
PRESENTS

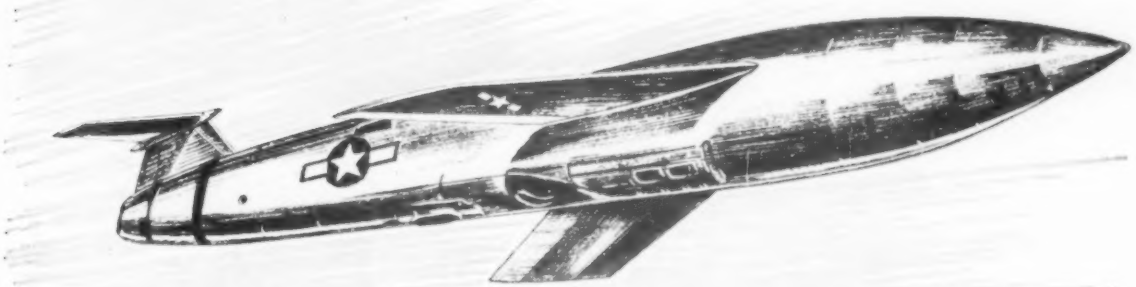
MILESTONES IN AVIATION

From Homemade Plane to Pilotless Bomber

It was on August 1, 1909, that Glenn L. Martin, self-taught flyer, took off at Santa Ana, California, on his first successful flight in the very first Martin airplane—a plane which Martin himself had personally designed and built in an abandoned church which he had rented. From that day on, the name of Glenn L. Martin has been inseparably linked with the progress of American aviation.

Martin milestones in aviation are many. His *China Clipper* flew the first scheduled trans-Pacific flights. His Army and Navy planes pioneered heavy aerial bombardment over land and sea.

Today USAF B-61 Martin *Matadors* make up the first squadrons of pilotless bombers—another milestone in aviation.



The Navy's new Marlin P-5M-2 anti-submarine seaplane is equipped with the latest electronic devices for detecting submarines in all weather. It carries a variety of torpedoes, rockets and mines, and has a tail-mounted gun turret.

Phillips Petroleum Company has been a pioneer in petroleum research for the development of more powerful, more efficient aviation fuels.

For example, Phillips was first to manufacture Di-isopropyl and HF Alkylate, two aviation fuel components of vital importance to modern high-speed, high-power performance.

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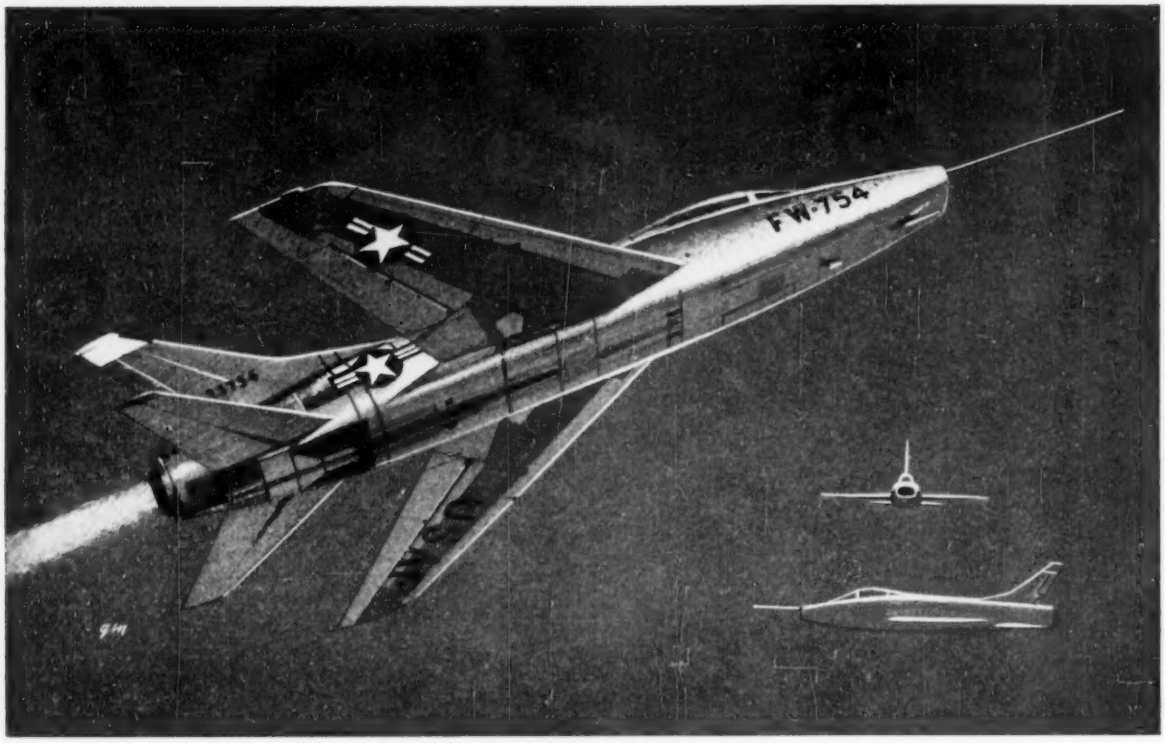

F-100 Super Sabre

USAF's First
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On her very first flight the Super Sabre smashed through the sound barrier in level flight . . . and later set a new speed record of 755.149 mph.

With this power, from a Pratt & Whitney Aircraft J-57 with afterburner, plus a ceiling above 50,000 feet and a combat radius of over 500 miles, this Super Sabre is truly a hot ship. Hot in more ways than one, for high temperatures in engine and airframe parts are inevitable in supersonic flight.

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NEWS DIGEST

Domestic

Chance Vought Aircraft reports its production force will be cut from the present 14,500 workers to 8,000 by early 1956 because of Navy's cancelation of a $75-million contract for 96 A2U-1s (AVIATION WEEK Nov. 29, p. 16). The Dallas company says layoffs will average approximately 500 employes a month in 1955.

F-99 Bomarc program is being expanded at Boeing Airplane Co.'s Seattle Division, with new laboratories, test and research facilities added to support the USAF supersonic guided missile project and more than 2,000 employes working on pilotless aircraft development.

Small turbojet engines for drone and pilotless aircraft will be produced by Fairchild Engine & Airplane Corp.'s Engine Division, Farmingdale, N. Y., and General Electric Co.'s Gas Turbine Division, Lynn, Mass., under new competitive development contracts awarded by the Air Research and Development Command.

Boeing B-47 was in the air more than 47 hr. and covered 21,000 mi. on a recent flight from the U. S. to England. When weather socked in at the Stratojet's destination, it shuttled back and forth to North Africa for aerial refueling while waiting for the weather to clear. Total fuel consumption: 75,000 gal.

DC-7C simulator will be designed and built by Curtiss-Wright Corp. for Pan American World Airways, is expected to be delivered in time to give PAA pilots "flight experience" before the airline gets its first new transport.

New avionic systems engineering laboratory will be set up by Radio Corporation of America in the Boston area, specializing in development of airborne fire control systems. The lab is expected to employ 100 scientists and technicians by the end of 1955, will be headed by Dr. Robert C. Seamens, Jr., former director of Massachusetts Institute of Technology's Flight Control Laboratory.

Fairchild Engine & Airplane Corp. has acquired the military business of Kendall Controls Corp., Waltham, Mass., manufacturer of pneumatic valves and control devices. Operation of the business will be merged with Fairchild's Stratos Division, Bay Shore, N. Y.

New Drop Tanks Double Copter's Range

A 165-gal. auxiliary fuel tank falls free of its bomb-rack attachment under the belly of a Piasecki H-21C during trials of the modification, designed to increase the helicopter's endurance. The tanks plus the H-21's normal fuel capacity provide a total of 634 gal., slightly more than doubling the copter's usual load. Placing the extra tankage externally saves cabin space for cargo; the jettisoning feature provides an additional safety margin. Both Air Force H-21Bs and Army H-21Cs are getting the new equipment. Tanks are made by Beech Aircraft Corp. and Fletcher Aviation Corp.

Improved Convair 340 with new features developed during the past year and a half is being marketed by the San Diego aircraft builder, will be delivered in 12 months after orders are placed.

New marker beacon that operates at VOR frequencies and eliminates the need for a separate airborne receiver has been developed and evaluated by Civil Aeronautics, Administration. The device is proposed for use with low-power omnirange serving as terminal area instrument approach aids at small airports.

Bell Aircraft Corp. has purchased Hydraulic Research & Manufacturing Co. through an exchange of stock, plans to use its new Burbank, Calif., subsidiary to produce servomechanical and hydraulic valves and systems.

Alfred W. Lawson, 85, aviation pioneer who won the first U. S. airmail contract in 1920 after he designed, built and flew a 26-passenger transport to prove the possibilities of commercial airlines, died Nov. 29 at San Antonio.

Hugh M. Johnston, 55, former communications superintendent for Pan American World Airways' Latin American Division, died Dec. 8 at Brownsville, Tex.

Financial

Beech Aircraft Corp., Wichita, reports a net income of $3,386,089 for the fiscal year ended Sept. 30, compared with a net loss of $2,321,052 during the previous 12-month period. Sales totaled $78,033,435 dropping from $140,457,780 (including $41,164,150 from a contract termination claim and subject to renegotiation). Backlog Sept. 30: $80 million.

Braniff Airways expects its net income for 1954 to total approximately $3.7 million. President Charles E. Beard says this forecast is based on an estimated $3.5 million for the first 11 months plus $200,000 expected in December. Beard also predicts Braniff will earn enough in 1956 to issue a 50-cent dividend, equal to the payment just declared.

International

"Flying saucer" project at A. V. Roe Canada's Toronto plant has been abandoned by the Canadian government, but the company plans to continue its research on the aircraft—described as "oval shaped with exhaust pipes." Amount spent so far by the government and Avro: $4.5 million.

Sapphire 7 turbojet has been type tested at 10,200 lb. thrust without injection, reheat or other boosting devices, reports builder Armstrong Siddeley. This is claimed as the highest yet announced for any British type-tested engines.

Soviet Russia has sold its interest in Red China's civil airlines for an unspecified quantity of goods to be delivered by the Peiping government in future years, according to Pravda.

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Washington Roundup

Jet Tanker Review

Lockheed, Douglas, Convair and Boeing executives are watching closely the review being conducted by Defense Secretary Charles E. Wilson's office of the recent USAF procurement award for the Boeing KC-135 interim jet tanker.

Wilson's decision on the interim tanker procurement will strongly influence USAF award on the ultimate tanker version, now subject of a hot design competition. USAF announcement of the KC-135 award was made while Wilson was out of town and approved by Charles Anderson, Deputy Secretary of Defense.

Plant Cognizance Battle

Don't be surprised if the long-standing struggle between USAF and Navy for cognizance over the key Pratt & Whitney Aircraft engine plants flares again soon. Navy cognizance dates to World War II when most P&W engine developments were Navy-sponsored. Virtually all P&W development programs from the J57 on—and including the J75 turbojet, T57 turboprop and atomic engine—are now USAF financed.

Only remaining Navy-sponsored development program at P&W is the J52 turbojet financed by diverting funds from the T52 turboprop project.

Wilson's New Problem

Defense Secretary Charles E. Wilson says he is busier than expected at this time of the year. What he did not expect, he told New Orleans Chamber of Commerce last week, was "the problem of getting a little better acquainted with some new (Democrat) chairmen of the Armed Services Committees and of the Appropriations Committees."

Wilson, who campaigned heavily for the GOP in the November congressional elections, said he is now approaching defense problems from the point of view that they are "above and beyond partisan politics." He said he now is sure most Americans, both Republicans and Democrats, basically are interested in security of the nation.

In spite of his problems with a new Congress, the Secretary has not lost his sense of humor. He said the governor of Louisiana offered to take him shooting with friends who have "wonderful bird dogs."

Award Announcements Subside

Wave of Defense Department contract announcements just before the November elections does not appear to have set a precedent for the Air Force. The Navy alone has followed up with regular award news. Silent for almost a month, the Army finally reported it expected to award $85 million in procurement and production contracts during November. It did not list items or companies with amounts but said the majority were for small figures.

USAF says it has no plans to issue any more lists at this time.

Last announcements were made on Oct. 30 ($135 million) and Oct. 13 ($1.2 billion). Air Force says these were made at that time only because a big list had accumulated and it will not make any more releases unless there are substantial awards to report.

Feeder Push

Look for a powerful thrust by local service airlines at the next session of Congress to obtain through legislation and congressional pressure permanent Civil Aeronautics Board certification and a more favorable formula for computing subsidies.

After squelching legislation in the Senate last session for permanent certification, the Administration has relaxed its attitude to the extent of favoring permanent certificates for some of the feeders. Strategy of the local service airlines will be based on the necessity for attracting investors, getting off subsidy payments sooner.

Missile Pot Boiling

Washington observers are wondering when the USAF missile development pot will boil over. Business maneuvers of USAF and missile manufacturers on intercontinental ballistics missiles developments are heavily screened by a military security blanket, but odds are that they will erupt into public debate soon after Congress returns to Washington.

Shooting War

American air commanders on the fringes of the Iron Curtain are becoming increasingly irritated by the growing number of incidents involving Russian fighters shooting down USAF and Navy aircraft.

Don't be surprised if there is more shooting back at the Russian attackers in the future, along the pattern of the Navy carrier-based aircraft that splashed two Red Chinese fighters during British transport rescue operations in the South China Sea. Extent to which Allied and Communist aircraft are moving through the same airspace on all sides of the Iron Curtain is vastly underestimated by the public.

Where Was USAF Brass?

USAF brass was conspicuous by its absence at the launching of the Navy's first super-carrier, the U.S.S. Forrestal, Dec. 11 at Newport News, Va. Although many VIP military transports made the short hop from Washington with Defense Department, Navy and Army brass, the only high ranking USAF official to show was Gen. Otto P. Weyland, Tactical Air Force Commander.

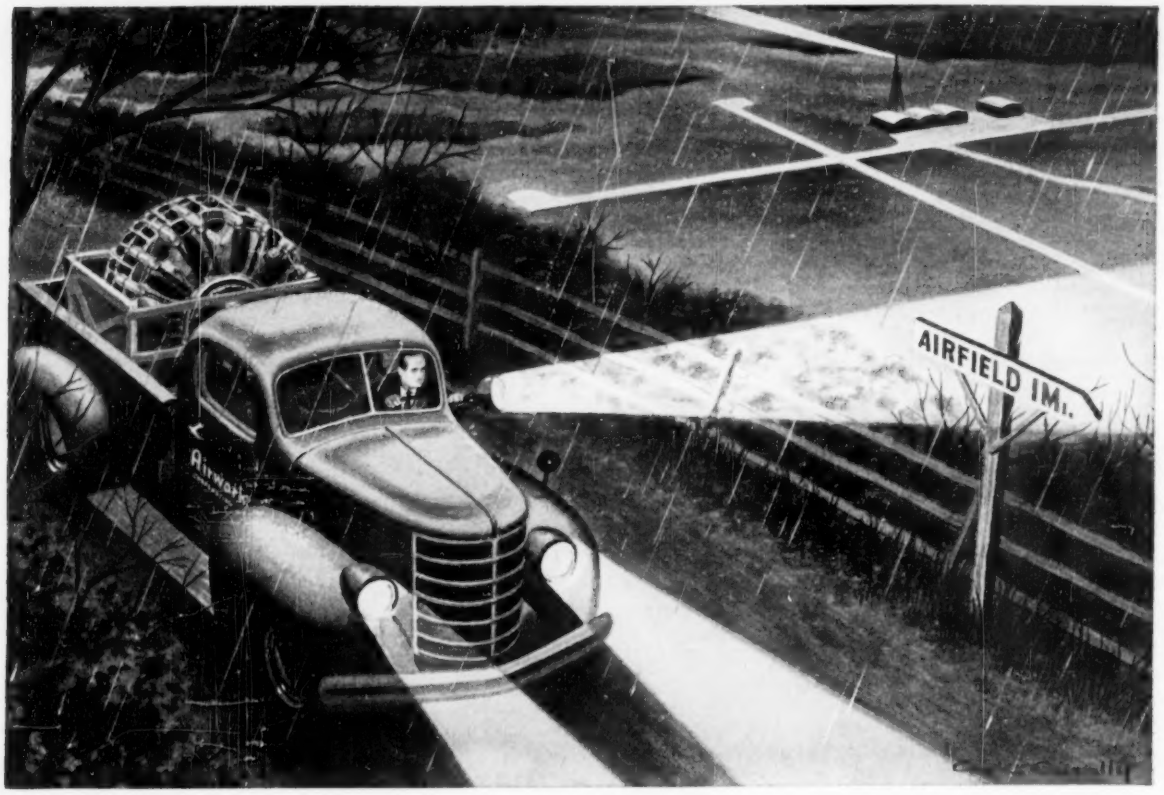
MATS Organization

Air Force continues to resist pressure from Defense Department to organize the Military Air Transport Service on an industrial fund basis similar to the Military Sea Transport Service. Nub of the Air Force argument is that it would only increase paperwork involved in charging other elements of the Air Force for MATS' services.

MATS was also the object of criticism from a House appropriations committee which complained over the assignment of such units as Air Rescue Service, Air Weather Service, Airways and Air Communications Service as a MATS responsibility.

Committee said that USAF directives had taken MATS far beyond its original mission of providing air transportation for defense agencies. MATS probably will face the same charges from the new Congress.

A TRUE STORY OF AIRWORK



THE PRESIDENT DROVE THE TRUCK

The phone call came through long after the plant closed, and all but the executive staff had gone home. That was over six hours ago. Now, it was midnight on a dark and lonely mountain road.

One more curve in the endless series of uphill turns. Then the headlights picked up the small airstrip . . . the crippled plane . . . the anxious looking men awaiting in front of the hangar.

Airwork was delivering an overhauled engine to a customer in trouble. The president drove the truck over 200 miles that night. Like every man in the company, he was taking his place in Airwork's tradition of Personal Service to the customer.

That tradition marks a business where the customer and his needs will always be important. You may never face an emergency as grave as that one. But the same interest and care will be ready to serve you, whether you need an engine, an engine accessory — or just an engine part.

Some of these days you will see a cream and blue Bonanza marked "Airwork Corporation". Talk to the men with it. Talk instrument grouping, ILS approaches . . . do some hangar flying.

You'll see why so many pilots and plane owners — people like yourself — are switching their engine and accessory overhauls and exchanges to Airwork — the company of, by and for pilots.

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WHO'S WHERE

In the Front Office

John R. Johnson is president of the recently reorganized Airquipment Co., will set up the Los Angeles firm for "major mergers within the aircraft industry."

Col. J. G. Vincent, co-designer of the first aircraft engine with parts standardized for mass production and the first diesel to power a plane, has retired as vice president-engineering of Studebaker-Packard Corp., Detroit (AVIATION WEEK Oct. 25, p. 18).

Allen D. Marshall has become vice president-management planning and secretary of General Dynamics Corp., New York.

Reagan C. Stunkel has been appointed vice president in charge of the new Electronics Division of Hydro-Aire, Burbank, Calif. New works manager: **Robert J. Trivison.**

Ray M. Wilson, co-founder of Frontier Airlines, has sold his interests in the company and resigned as chief of operations.

Changes

Maj. Gen. William L. Richardson (USAF, Ret.) has become manager of defense projects coordination for Radio Corporation of America's Engineering Products Division, Camden, N. J.

John F. Taggart has moved up to general manager of Rheem Manufacturing Co.'s Government Products Division, also will be general manager of the Downey, Calif., plant.

Dr. Neil W. Lamb has been appointed longrange planning administrator for Convair, will analyze the San Diego company's development and production plans for the next 10 years.

Robert H. Jewett is new chief engineer of Boeing Airplane Co.'s Pilotless Aircraft Division at Seattle. Other changes: **George Snyder,** chief project engineer, and **W. H. Cook,** chief of technical staff, pilotless aircraft; **Donald W. Finlay,** chief of preliminary design for the Seattle Division.

Dr. Franz J. Neugebauer, World War II plant manager of Germany's Air Research Institute and postwar consulting engineer at Wright-Patterson AFB, has become a consulting engineer for thermal systems in General Electric Co.'s engineering laboratory at Schenectady, N. Y.

Honors and Elections

H. M. Horner, president of United Aircraft Corp., has been elected chairman of the board of governors of Aircraft Industries Assn. for the first half of 1955. **J. C. Garrett,** president of Garrett Corp., is chairman for second half.

Robert E. Gross, president of Lockheed Aircraft Corp., has won the Los Angeles Advertising Club's Hourglass award for "continuing progress in aeronautics."

Jerome Lederer, managing director of Flight Safety Foundation, Inc., has been awarded the Ir. G. A. von Baumhauer Fund bronze medal by the Royal Netherlands Aero-Club for "the most valuable contribution . . . to flight safety."

INDUSTRY OBSERVER

► Pan American World Airways is expected to sign the first contract soon for Boeing's commercial jet transport based on the 290,000-lb. gross KC-135 military tanker. PAA would use the Boeing jet transport for nonstop trans-Atlantic service. Prospect of competition with British Overseas Airways Corp. also has stirred Pan American interest in the Douglas DC-7D powered by Rolls-Royce R.B. 109 turboprops.

► Pratt & Whitney Aircraft's Atomic Engine Research Laboratory will be built on a 1,100-acre tract near Middletown, Conn., about 20 mi. south of the main P&W plant at East Hartford. Construction on the $10-million facility is expected to begin late in 1955 with design of the laboratory scheduled for completion by next July. Design is being done by the New England division of the Army Corps of Engineers, Boston, Mass. USAF is financing the laboratory.

► First all-magnesium fighter, a Lockheed F-80C whose structure was designed and built in the lightweight metal by East Coast Aeronautics, Pelham, N. Y., a subsidiary of Barium Steel, is at Mitchel AFB for preflight inspection. The plane will make its first flight early in January.

► Lockheed expects that its L-1449 turboprop-powered Super Constellation will be able to beat the block speed of the de Havilland Comet 3 between New York and Paris. The T34-powered Connie will be able to make the flight nonstop, while the Comet 3 will require at least one refueling stop.

► Grumman expects to flight test the first transport version of its S2F twin-engine anti-submarine warfare plane early next year. The transport versions will be quickly convertible to carry either eight passengers or more than 1,600 lb. of cargo and will replace the TBF converted torpedo bombers now used on the "codfish" airline that maintains communications between aircraft carriers at sea and land bases.

► Trouble which led to grounding of North American Aviation's F-100 has been attributed to a highspeed yaw encountered at speeds over Mach 1 which subjects the aircraft to side forces well beyond its design limit. The Super Sabre, in which NAA test pilot George Welch was killed, was heavily instrumented and more than half of these instruments were recovered intact. Company and Air Force investigation into the series of crashes is continuing, while the F-100 remains grounded.

► De Havilland Gyron, supersonic turbojet, will make its first flight in a modified Short S.A. 4 Sperrin. Modification of airplane currently is being made at Short's plant.

► Curtiss-Wright Corp. has developed an airflow modulator to prevent excessive turbojet blade vibration at low rpms., is putting the new device on J65 engines now coming off the line. The unit cuts in at 5,500 rpm., guides the air into the roots of the compressor stages and starts to cut out at 6,500 rpm.

► Piasecki Helicopter Corp.'s first YH-16, twin-engine 40-passenger helicopter powered by P&W R2180s, has completed its structural flight-testing program with less than 15 hr. on the aircraft since the first flight more than a year ago. The YH-16A, powered by two Allison T38 turbine engines, is on ground runup stand with more than 20,000 lb. of ballast in cabin, ready for first power tests.

► Douglas Aircraft has a new Navy contract for an aircraft designed by its El Segundo Division's chief engineer Ed Heinemann that will surpass both the F4D and A4D in performance.

► HUP-4, Piasecki shipboard helicopter powered by a Wright R1300 engine replacing Continental R975, will make its first flight before Jan. 1. First aircraft will use only 600 of 800 hp. available. Second HUP-4, which will be ready early next year, will utilize full 800 hp.

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Defense Directive Muddles Buying Picture

- **Wilson's order for 'sound mobilization base' in armed forces procurement touches off confusion, criticism.**
- **Top officials ordered not to interpret document, are given 30 days to revise buying procedures.**

By Claude Witze

A major muddle appeared last week in Defense Department procurement circles because of a new directive issued by Defense Secretary Charles E. Wilson, ordering the armed forces to plan their buying to maintain a "sound mobilization base."

For more than a week after the directive was issued, strict censorship was imposed and even Pentagon officials at high levels were forbidden to discuss the directive publicly or attempt to explain it.

▶**Flood of Inquiries**—In addition, there was a possibility the directive violated the Small Business Administration Act of 1953, under which a federal agency may be required to "consult and cooperate" with SBA on procurement policies.

The Wilson document was issued unobtrusively after close of the normal business day. One newspaper printed only the text of the directive and the next day received 400 inquiries from readers seeking more information. Major questions:

- Is the directive an actual change of military buying policies or a restatement of existing rules designed to help buyers in some areas?
- In planning procurement, the directive says, attention must be paid to "essential mobilization suppliers." How does a supplier get in this category?

Procurement officials in the Pentagon, ordered not to attempt interpretation of the directive, fell back on two paradoxical replies:

- The purpose of the directive, as stated in the text, is "to integrate" policy with mobilization plans. Those adhering to this phrase discounted the possibility that there will be any change in procurement policy.
- They have 30 days to revise regulations, procedures and instructions to carry out the new directive. It is too early to discuss details.

▶**Praise, Criticism**—Response to the new directive from members of Congress was equally diverse. Sen. Henry M. Jackson (D., Wash.), who had criticized Secretary Wilson for favoring large companies, particularly General Motors Corp., praised the new order, calling it a "significant contribution to U. S. security."

Sen. Edward J. Thye (R., Minn.) expressed serious concern about the directive. He interpreted it as an order to set up a list of preferred firms to receive "the bulk of defense contracts with no competition allowed from firms not on the select list."

One spokesman on Capitol Hill said he thought Jackson had made his statement before it was made clear exactly what the Wilson order meant.

Reporters who spent a week trying to penetrate the Pentagon freeze uncovered a long list of possible interpretations but no definite information.

▶**Preferential List**—The Wilson directive, dated Dec. 7, requested the Army, Navy and Air Force to review proposed procurement of items on the Defense Department's preferential planning list, with consideration to:

- Maintaining multiple sources of supply.
- Geographic dispersal.
- Avoiding undue concentration of contracts in a few leading suppliers.
- Multiple awards.
- Preserving essential skilled labor forces.
- Utilizing existing open industrial capacity.
- Preserving essential management organization and "know-how."
- Maximum subcontracting.
- Any other factors relevant to maintaining a sound mobilization base.

▶**Premium Prices**—The directive referred to Office of Defense Mobilization Order DMO VII-7, as amended. Most recent amendment of this order was dated Nov. 24 and consisted of deletion of one sentence from the original. The sentence:

"The general policy in cases where suppliers who are part of the mobilization base are unable to compete successfully on a bid basis shall be to re-examine the mobilization base to determine if the capacity can be maintained without inclusion of high cost producers."

Practical effect of the deletion would be to permit the armed forces to pay premium prices for items if this is necessary to keep a mobilization supplier in operation for any of the reasons listed in the Wilson directive of Dec. 7.

The Senate Small Business Committee had understood that Wilson frowned upon the awarding of contracts to other than low bidders. In view of the juxtaposition of the ODM and Wilson orders, a spokesman said last week: "We now wonder which is the chicken and which is the egg."

▶**Small Firm Threat?**—Both industry and Pentagon sources indicated that military buyers have been making a practice of paying a price differential on certain key items where the mobilization base would be threatened by giving an award to the low bidder. This is the school of thought that views Wilson's policy directive as a permissive document whose purpose is to ease the problem in these cases.

Viewpoint of the Senate Small Business Committee, as expressed by Sen. Thye in a telegram to Wilson, was

Defense Budget

The Defense Department's budget request for fiscal 1956, now in final drafting stage at the Pentagon, will approximate the $34.5 billion appropriated for 1954, according to Secretary Charles E. Wilson. This will be an increase of $4.9 billion over the amount approved by Congress for fiscal 1955.

Expenditures in fiscal 1955 now are estimated at less than $35 billion, Wilson said, down from the $37.5 previously estimated. Carryover funds, he reported, will be reduced $17 billion between June 30, 1953, and June 30, 1955, bringing them down to $45 billion.

The Secretary also said Defense Department hopes to continue spending for research and development at the current rate of about $1.25 billion a year.

He gave the figures in a speech before the chamber of commerce in New Orleans.

that the new order may be a threat to small firms who are a "mobile and potent productive force in times of emergency."

Questions put to Wilson by Thye:

- Was the Small Business Administration consulted in the preparation of lists of essential suppliers as provided in the Small Business Act of 1953?
- How can smaller firms become essential mobilization suppliers?
- How will the directive affect the Joint Determination Program of the Defense Department and SBA?
- How will it affect the small business programs of the military departments?
- To what percentage of defense contracts, by number and by dollar value, will the new policy apply?

Thye said he was disturbed by a clause in the directive that calls for exclusive use of negotiated contracts under terms of the Armed Forces Procurement Act. He said this implied an end to price competition.

The Wilson directive startled the Small Business Administration and the Senate committee as much as anyone else. It was, they said, totally unexpected and efforts to get further information were as futile for the committee as they were for the press.

CAB Blames Tower In Convair-SNB Crash

Collision of an American Airlines Convair and a Navy SNB June 27 at Columbus, Ohio, was due to the failure of the Port Columbus Airport tower to control properly the traffic situation, Civil Aeronautics Board reports.

The Navy aircraft crashed at the airport, killing both occupants of the airplane.

The Board found that the probable cause of the collision was "a traffic control situation created by the tower local controller which he allowed to continue without taking the necessary corrective action." Failure of both crews to detect the situation through visual vigilance is listed as a contributing factor.

The accident occurred just after sundown when both aircraft were instructed to land on the same runway, and the tower allowed them to make their approaches almost simultaneously. After observing the positions of the approaching aircraft, the tower advised the Navy plane either to make a 360-deg. turn or circle the field. When the SNB pulled up and began its turn, it collided with the Convair. The Navy aircraft caught fire on impact, crashed and burned. The Convair landed safely, but the nose wheel collapsed during landing roll—causing extensive damage. None of the Convair passengers or crew was injured seriously.

WORLD'S LARGEST AIRCRAFT CARRIER, U.S.S. Forrestal, is tugged to dock for fitting.

Forrestal Opens New Carrier Era

A new era in naval aviation was launched and an old airpower controversy revived as the 59,600-ton U.S.S. Forrestall slid out of the graving dock at Newport News, Va., to become the first of the Navy's super-carriers to float.

The giant Forrestal, twice the size of the largest World War II aircraft carriers, is the first of a series of 10 super-carriers planned by the Navy as its new "ships of the line" for atomic warfare at sea.

The Forrestal (CVA-59) will be followed by the Saratoga (CVA-60) being built at the Brooklyn Navy Yard and the Ranger (CVA-61), also under construction at Newport News. The fourth super-carrier (CVA-62) will be built at Brooklyn and funds for a fifth will be contained in the fiscal 1956 defense budget.

Forrestal Specs

Length: 1,036 ft. (equal to five city blocks).
Height: Keel to mast-top equal to 25-story bldg.
Width: 252 ft.
Displacement: 59,600 tons.
Horsepower: 200,000.
Speed: Over 30 kt.
Flight deck area: 4 acres.
Crew: 3,500 (including air group).
Aircraft: 125 jet fighters and attack bombers.
Catapults: 4, steam-driven.
Elevators: 4, deck-edge type.

▶ **Criticism Target**—Navy bases its case for the super-carriers on the operational requirements of modern transonic, jet-powered aircraft that demand a new type of operating area at sea, just as they require new types of airfields on land. As the first of the super-carrier line, the Forrestal is destined to bear the brunt of criticism aimed at naval aviation roles in atomic warfare.

Appearance of the Forrestal on the waters of Hampton Roads seems certain to stimulate fresh debate in the inter-service controversy between USAF and Navy over the relative merits of longrange, land-based bombers and carrier-based aviation when the fiscal 1956 defense budget appears on Capitol Hill early next year.

▶ **Forrestal Features**—Although some of the 27,000-ton Essex-class carriers have been converted to steam catapults and canted decks required for operating modern, highspeed jet aircraft at sea, the Forrestal is the first carrier designed from the start to meet the operational

needs of the sweptwing, longrange jet fighters and bombers already rolling out of aircraft factories for service in the U. S. Navy.

New features of the U.S.S. Forrestal which affect its aircraft operations include:

• **Flight deck.** The Forrestal flight deck covers approximately four acres. In contrast to earlier decks that were imposed on top of the ship's structure, the Forrestal's 1¼-in. steel plate deck is an integral part of the ship's structure.

This type structure is necessary in order to stand the heavy pounding of jet plane landings and the hot blast from tailpipes.

The Forrestal also has a canted flight deck design, enabling landings to be made away from the island superstructure and forward deck load of planes. A 55-ft. overhang on the port side is necessary to provide the canted landing area.

• **Steam catapults.** Four steam catapults are installed on the flight deck with two operating over the bow, two off the canted flight deck. This permits simultaneous launchings from both areas, enabling the air group aboard to get its planes in the air faster. The steam catapults are necessary for launching the new Navy jet attack planes, such as the 70,000-lb. Douglas A3D.

• **Elevators.** Four of the largest elevators ever built for a carrier are mounted on the deck edges of the Forrestal—three on the starboard side, one on the port. This type elevator permits greater structural integrity for the flight deck than the old mid-deck elevators, and allows the planes coming up from the hangar deck to be fed directly into the forward catapults. Each of these 166-ton elevators has a platform 52 by 62 ft.

• **Hangar deck.** Size of the hangar deck has been increased to accommodate both the larger size jet aircraft scheduled for Forrestal-type carriers and also to handle the increased maintenance work required for more complex planes now used by the Navy.

• **Arresting gear.** A new hydraulic pneumatic arresting gear has been designed for the Forrestal class which is capable of halting a 70,000-lb. aircraft landing at a speed of 100 mph. in a space of 150 ft.

The Forrestal will be delivered to the Navy late next year and will enter fleet service complete with air group in 1956.

New Lockheed 'Shoots' With Cameras

First flight view of the new Lockheed RT-33, single-seat, photo-recon version of T-33A two-place jet trainer, shows modified nose housing a battery of charting and mapping cameras that "shoot" through transparent panels in sides and bottom. Pilot has a tape recorder for describing picture subjects. RT-33 is in production for delivery through the U. S. Air Force to Mutual Defense Assistance Pact countries.

Aircraft Strike Threat Eases on West Coast

Los Angeles—Threat of strikes in the West Coast aircraft industry diminished considerably last week.

Workers at the Douglas Aircraft Co. in Santa Monica followed the lead of fellow employes at El Segundo in accepting a new contract. North American Aviation, Inc., reached an agreement with United Auto Workers (CIO). Northrop Aircraft, Inc., announced wage increases for its employes. Negotiations at Lockheed Aircraft Corp. and Convair were reported to be proceeding smoothly.

▶ **First Pension Plan**—North American's agreement provides for the first union pension plan in the aircraft industry on the West Coast. The plan covers hourly paid employes who retire at 65 and have completed at least 10 yr. of credited service. Details of the provision still are to be ironed out.

UAW-CIO president Walter Reuther's administrative assistant Jack Conway says, "It is patterned after General Motor's pension plan" and believes it superior to any now operative in the aircraft industry.

NAA's new agreement also provides for an average increase of 8 cents an hour, bringing hourly minimums and maximums up to $1.54 and $2.53.

▶ **5 to 7 Cents Plus**—Lodge 1578 of the International Association of Machinists (AFL) ratified a contract calling for a wage increase averaging from 5 to 7 cents an hour plus fringe benefits at Douglas-Santa Monica.

The contract was similar to one accepted Dec. 5. at the El Segundo plant (Aviation Week Dec. 13, p. 15). The Santa Monica agreement covering 14,000 workers went into effect Dec. 13 and will expire Apr. 1, 1956.

Negotiations had been underway since Sept. 1.

▶ **$2.5-Million Boost**—Northrop president Whitley C. Collins announced wage boosts averaging 7 cents an hour for 16,750 employes. Maximum and minimum hourly scales also were increased.

The new wage scale, which went into effect Dec. 13, adds $2.5 million a year to the company payroll, Collins said. Northrop workers are non-union.

The pay raises will apply to all Northrop plants in California and Florida.

"As indicated by past history of our negotiations, it is not at all unusual at this stage to have a number of items still unsettled," reported H. R. Campbell, chairman of Lockheed's negotiating committee. Lockheed workers are represented by IAM Lodge 727. Negotiations have been underway since Nov. 2.

New F4D Record Trials

Douglas Aircraft Co. may try for some new records with the F4D Skyray as soon as the desert weather warms up again, if it can win Defense Department approval.

Now that the carrier-based F4D Navy fighter is equipped with the Pratt & Whitney J57 engine, Douglas engineers believe it can outspeed the North American F-100 on the 15-km. course as well as the 3-km. course (Aviation Week Nov. 16, 1953, p. 18). The more powerful engine also might enable the F4D to set the altitude record it failed to achieve with the Westinghouse J40.

New entrant looming in the speed competition between the F4D and the F-100 is Lockheed Aircraft Corp.'s F-104 lightweight fighter.

Lockheed has this to say on the subject: "Any decision about attempting speed records with the airplane will, of course, rest with the Air Force—for which we are producing the F-104.

"It is hardly likely, in any case, that the Air Force would decide to make a speed record attempt with any airplane until it has progressed further in its flight test program than the F-104 has at this point."

C. R. Smith Belabors Rails for Air Sniping

Los Angeles—American Airlines president C. R. Smith suggested last week that the railroads stop sniping at their air and truck competition and concentrate on improving their service.

Taking up what he called the "railroad problem" of diminishing traffic, Smith said: "It is not probable that the problem will be solved by belaboring the competitors of the railroad. That policy has not been successful in the past and there is no reason to predict better success in the future."

Smith's attack on the attitude of railroad management came in an address at the California Club. The airline executive's speech, entitled "Opportunity for Transportation," might better have been labeled "How to Run a Railroad."

▶ **Wasted Attacks**—In prewar days when rail traffic declined, Smith asserted, there was an urge to "do something to somebody else," with attacks in legislative halls against trucks and buses. "But the truck and bus lines continued to grow," he said, "for the reason that they provided a service which their customers preferred to that offered by the railroads."

The airline executive said there is evidence of a revival of this policy, a feeling that something should be done to the airlines. If carried forward, Smith said, this policy will prove as wasteful as other similar endeavors for two reasons:

• **Air transportation** has become the accepted form of first-class travel for middle and long distances. The customer will not again prefer a three-day journey from coast-to-coast when 8-hr. service is available.

• **The airlines** do not compete with the railroads in the principal area of potential railroad traffic—heavy, mass volume freight. If all of the freight transported by the airlines could be transferred to the railroads, the net effect would be an indistinguishable imprint on the railroad problem.

▶ **Little Subsidy**—Of the railroad argument that airlines are subsidized while railroads pay their own way, Smith made these points:

• **Direct subsidy.** Very few of the trunk airlines are subsidized today. In 1953, 92% of the domestic air passenger-miles were provided by carriers receiving no subsidy from the federal government.

• **Airport charges.** The airlines now pay for their use of airports. The level of these charges is fixed by negotiation between the airlines and the airport operators.

A measure of the fees paid at the principal airports is shown by these figures: For the year 1953, airport data for the 41 largest cities in the United States, excluding those with airport authorities, shows total airport revenues exceeded operating expenses by 35%.

• **Federal airways.** The airlines pay about $15 million a year in fuel and oil taxes to the federal government for use of the airways system. This is a proper charge, as an automobile fuel tax is for the use of the highways.

Backbone of the railroad problem is the high percentage of former rail traffic now carried by competitive transportation, Smith said. The decision to make the change was made by the customer because the service provided by the competitor was better, he added.

New Buyers' Guide

Air Force Procurement Instruction, consolidating all instructions governing USAF buying and contracting, has been issued as a procurement guide.

The new Air Force publication contains detailed instructions for carrying out the basic policies of the armed services procurement regulation, the top guide for all military procurement.

Chicago Copter Line Gets Weak PO Support

Helicopter transportation of mail in the Chicago area received a mixed endorsement in a statement filed by the Post Office Department at a prehearing conference before a Civil Aeronautics Board examiner in the Helicopter Air Service, Inc., certificate renewal case.

The Post Office is satisfied with the Chicago operation but is not interested in pushing the service. A Post Office representative said the helicopter airline had demonstrated the practicability of transporting airmail by copter and had performed a creditable service.

But "the benefits of helicopter service for airmail in the Chicago area are marginal in view of the network of truck routes that have been established," the department reported. "Nevertheless, the Post Office . . . believes there are substantial potentialities for this type of air transportation."

If CAB decides to renew the helicopter carrier's certificate, the Post Office will continue to use the airmail service.

Army Reports Nike Can Hit Jet Aircraft

Army's Nike missile can hit jet planes but does not use them for targets because of high cost, according to Maj. Gen. James M. Gavin, assistant chief of staff, G-3, operations.

"The Nike is effective against any type of aircraft including jet aircraft that have been furnished from the other services," Gavin said. "Because of the high cost entailed in destruction of great numbers of modern highspeed aircraft, however, the Army has simulated targets of extremely high speed, high maneuverability and high altitude and fired Nike successfully at these targets.

"In this respect, Nike has entirely measured up to our expectations of its performance. Based on that performance to date, we are convinced that Nike is an effective weapon against modern aircraft and aircraft of the foreseeable future."

The general's statement, in a talk before the American Ordnance Assn., refuted the opinion of Air Force Secretary Harold E. Talbott, who was quoted as saying Nike photos showed the missile hitting "an old propeller-driven plane doing about 200 mph." (Aviation Week Dec. 6, p. 14).

Gavin also reported the Army is working on "a more maneuverable and useful version of the Honest John System" bombardment missile.

He said all Army weapons systems allow for growth and modification to allow for new scientific advances.

AIRCRAFT TURBINE FACILITIES will be consolidated under new plan at this government-owned Westinghouse plant at Kansas City.

Westinghouse Puts Millions in Jet Program

By Robert Hotz

Kansas City—Westinghouse Electric Corp. has reached a top-level management decision to expand and improve its Aircraft Gas Turbine Division. It will invest $19.5 million in corporation funds to begin the new program.

This new Westinghouse jet program involves:

- **Construction** of a $12.5-million research and development laboratory adjacent to the government-owned plant now occupied by this division south of Kansas City. This laboratory will be financed by Westinghouse. Sanderson & Porter of New York has been awarded the architectural and engineering contract for the facility.
- **Investment** of $7 million in Westinghouse money in a jet engine development program aimed at producing new designs for military and civil markets.
- **Establishment** of a jet engine flight test center at the Olathe, Kan., Naval Air Station.
- **Augmentation** of management, engineering and production staffs. The new management team is headed by W. Waits Smith, general manager, who joined Westinghouse from Studebaker Corp. 11 months ago.
- **Continuation** of its technical interchange and sales agreement with Rolls-Royce, Ltd., of England.
- **Consolidation** in the future of all the division's facilities at the Kansas City plant. Development facilities now occupied by the division at South Philadelphia will be absorbed by expansion of the Westinghouse Steam Turbine Division there.

Gwilym Price, Westinghouse president, emphasizes that the corporation is in the aircraft propulsion business to stay and now is backing this determination with its own money.

"Westinghouse has every intention of staying in the jet engine business," Price says. "As a matter of fact, with the consolidation of our activities at Kansas City plus the addition of new, adequate laboratory facilities now under way, Westinghouse will be in a far better position to do the development and production work necessary to insure our position as a major participant in this fast moving business."

▶ **Lack of Facilities**—Westinghouse is starting its comeback in the jet engine business from a relatively low ebb after initial success in pioneering the axial-flow design in this country with the 1,800-lb.-thrust 19XB during World War II and the 3,000-lb.-thrust J34 that performed well in Korean combat in McDonnell Aircraft Corp.'s carrier-based Banshee fighter.

In tackling an expanded postwar development program on the 4,000-lb.-thrust J46 and the 7,500-lb.-thrust J40, Westinghouse was constricted by lack of modern development facilities and the engineering staff for swift explorations in the gas turbine powerplant field.

Its development facilities, expanded little since World War II, were in South Philadelphia. Its flight test facilities were split between Newcastle, Del., and Dallas, and its production plant was in Kansas City.

In addition, Westinghouse aircraft turbine development was dependent on the National Advisory Committee for Aeronautics' windtunnels at Cleveland for installation and altitude tests of its engines.

▶ **Concentrated Effort**—These factors did not combine to produce a swift development pace. As a result, the Navy replaced the J40 in a number of aircraft production programs with engines that developed faster. Recent Navy cancelations of Chance Vought and McDonnell fighters powered by the J46 and J40 (AVIATION WEEK Nov. 29, p. 16) indicate the production runs for these engines will end during 1955.

Recognizing these problems, Westinghouse management decided not to withdraw from the aircraft propulsion field but to concentrate, expand and improve its effort in an attempt to regain its earlier position as a leader in the business. The entire gas turbine effort soon will be concentrated in the Kansas City area—with research, development, engineering and production all under one roof and flight test facilities only 20 mi. away.

The Aircraft Gas Turbine Division now occupies slightly more than 2 million sq. ft. of the 3-million-sq.-ft. government-owned plant at Kansas City, built by Pratt & Whitney Aircraft during World War II, and some development facilities in South Philadelphia. Employment at Kansas City now is 5,000 persons working in two shifts, with 1,400 employed in South Philadelphia.

▶ **Mobilization Base**—The Kansas City plant has all facilities required for aircraft engine production under one roof, including one of the largest investment casting facilities in this country. All the Kansas City machine tools are government-owned.

Although the Kansas City plant contains equipment for every type of manufacturing operation required in jet engine production, Westinghouse has organized a subcontracting and suppliers network that provides a second source for all of its engine parts and will be retained as a mobilization base for emergency expansion.

The corporation also has begun to lay a solid research and development foundation on which to build its future sales and production efforts. It is pumping corporation funds into what has been virtually a Navy-financed program to speed both the provision of adequate development facilities and to finance privately development of new engines.

▶**High-Power Tests**—The new $12.5-million laboratory will occupy about 230,000 sq. ft. and be equipped to do high-power testing on compressors, turbines, afterburners and fuel systems. Construction will begin early in 1955. Westinghouse will build low-power component test facilities and is planning an aerodynamic laboratory.

Facilities for complete engine testing at sea level conditions already are available in the plant's test cell area. Westinghouse does not plan any altitude test chambers in the new development facilities at this time, although they may be added later.

▶**Rolls-Royce Facilities**—Flight test facilities to be established shortly at Olathe will support a North American B-45 multi-jet bomber rigged to carry test engines in a bombbay pod, two Chance Vought F7U Cutlasses and a Douglas F3D. A large new experimental machine shop now is being tooled at the Kansas City plant for development work.

In addition, Westinghouse can use the experimental machine shop, development laboratories and flight test facilities of Rolls-Royce in England to augment its own efforts. Westinghouse has established a hostel near Derby for engineers working with Rolls and is rotating engineering personnel on three to six month tours, with an average of nine in the Rolls plants at all times.

The British company is doing component checks, installation design and other experimental work on Westinghouse projects. Rolls also is maintaining a flow of engineering personnel to the Westinghouse development facilities in South Philadelphia and Kansas City. The current Rolls-Westinghouse agreement, signed in 1953, is for eight years with option for renewal.

▶**Development Philosophy**—Westinghouse engine development philosophy is based on two major convictions

• Future emphasis will be on optimum-size aircraft engines rather than simply the highest power output. Westinghouse engineers are planning to work in the 2,000-8,000-lb.-thrust range—aiming at optimum combinations of weight-power ratios, low frontal area and fuel specific rather than shooting for the highest possible power regardless of its cost in weight, drag and fuel.

• Future emphasis will be on reversing the present trend toward increased complexity in aircraft engines and making them more simple to operate and manufacture.

Westinghouse engineers believe the present complexity of jet engines and their controls make it extremely difficult and costly to produce large quantities fast enough to meet military combat requirements. They are devoting a major effort to simplifying designs to make engines easier to manufacture in quantity and to increase their operational reliability in the field.

▶**Nuclear Possibilities**—General manager Waits Smith told AVIATION WEEK the division plans to work in the entire spectrum of aircraft powerplants and that its future developments will not be restricted to gas turbine types.

The division does not now have any active project for developing aircraft nuclear propulsion, but Westinghouse has been a pioneer in developing nuclear power for ships and civil use.

It is likely that the Aircraft Gas Turbine Division is not unaware of the nuclear possibilities for plane propulsion.

▶**Dart Market**—While its own development program is hatching, Westinghouse has the U. S. sales and manufacturing rights for all Rolls-Royce engines except those sold as part of British-manufactured airframes. Thus if Rolls sells its R.B. 109 turboprop to Douglas Aircraft Co. for the DC-7D (AVIATION WEEK Oct. 18, p. 13) and its helicopter projects, Westinghouse will handle the project. But it will not have anything to do with Capital Airlines' purchase of Rolls Dart turboprops as part of the Vickers Viscount transport.

There is strong American interest in the Rolls turboprop line for commercial airliners. Convair, Lockheed Aircraft Corp. and Fairchild Engine & Airplane Corp. are interested in the 2,000-shp. Dart for medium-range transports.

Westinghouse says it is interested in manufacturing the Dart for the American market if airframe builders can assure them a large enough market. Westinghouse manufacture of the R.B. 109 for the Douglas airframes is another possibility.

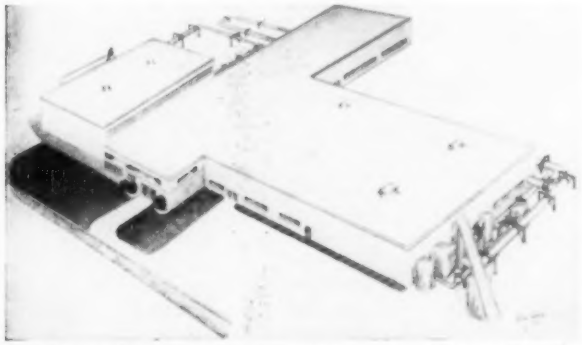
▶**Soar Sales**—The Aircraft Gas Turbine Division already has handled the sale of the Rolls 1,800-lb.-thrust Soar to USAF for supersonic target drones and, if required, will handle modification of the engine to American standards at Kansas City. Since there is no U. S. engine in this thrust class, there may be a wide market for the Soar in this country.

Westinghouse is aided in its American sales effort on Rolls engines by the crack British sales team headed by Lord Hives, managing director of the British firm, and J. D. Pearson, manager of its Aero Engine Division.

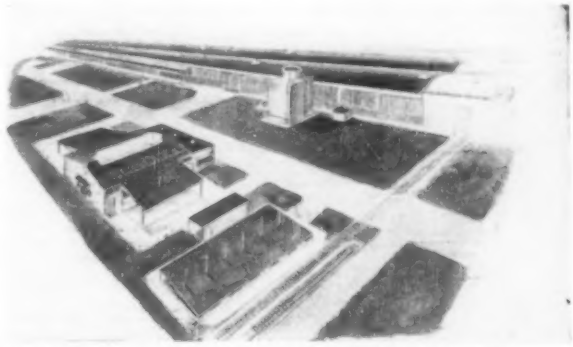
There also is some American interest in the Rolls Conway bypass turbojet for civil and military jet transports. Westinghouse is pursuing the bypass design in its own development program.

▶**Success Planning**—Although building Rolls jet engines under license for American use may tide Westinghouse through a slack period in its production facilities, just as it did earlier for Pratt & Whitney Aircraft, Waits Smith emphasizes that his division is banking its future on its own development program and the new engines it produces.

There is no doubt that Westinghouse is determined to make the effort required to get back into the thick of the jet engine business. But it will be at least five years before the success of this effort can be accurately assayed.



HIGH-POWER aircraft turbine lab shown in sketch with . . .



LOW-POWER test facilities, also to be built at Kansas City.

Lufthansa Expects Fast Comeback

But some observers say West German airline cannot overcome 10-year advantage held by its competitors.

Frankfurt—Officials of West Germany's Lufthansa predict the airline will make a rapid comeback after it resumes service Apr. 1, despite doubts of some observers that the reviving international air carrier can overcome the 10-year edge held by competitors.

Dr. Kurt Weigelt, chairman of the Lufthansa board—a post he held before World War II, says: "Because Germany lies in the center of Europe, she has experienced great difficulty in obtaining adequate freedom of the seas. But the air is free and, to restore Lufthansa's routes, it is necessary only to obtain reciprocal landing rights in the necessary main traffic and trade centers.

"This has not been difficult because the airlines of many nations now are flying to Germany, and they must give us reciprocal rights."

▶**U.S.-British Fight**—Meanwhile, competition between British and U.S. plane builders to sell the airline more equipment has become fiercely competitive.

Lufthansa recently took delivery on its first Convair 340 (AVIATION WEEK Nov. 29, p. 78) and has in addition three of the San Diego-built transports on order. The carrier also has ordered four Super Constellations from Lockheed Aircraft Corp.

The British are trying to convince the Germans that the American aircraft are obsolete. If Lufthansa expects to compete in Europe, the British argue, it must order English turboprop aircraft.

West German officials appeared very concerned over the report during interviews with AVIATION WEEK.

Lufthansa hopes eventually to increase its fleet to a minimum of 40 aircraft so the market for which British and American manufacturers are competing is a sizable one.

▶**Turboprop Interest**—Despite British charges of obsolescence, Lufthansa officials say they decided on Convair and Lockheed aircraft because of their long record of efficient airline service. Speed of delivery was another consideration.

It is likely that the new Lockheed L-1449 turboprop Super Constellation (AVIATION WEEK Dec. 6, p. 17) will attract strong German interest for its planned international routes.

The airline will use its twin-engine Convairs for European flights to London, Paris, Zurich and Madrid, placing its Super Constellations into daily service between Hamburg and New York.

The airline hopes within three years to expand its operations to Africa, Asia and South America.

Lufthansa is constructing a large maintenance base at Hamburg, following a spirited battle between several German cities for the maintenance center. Its initial operation within Germany will serve Hamburg, Dusseldorf, Wahn, Frankfurt and Munich. Wahn serves both Cologne and Bonn.

▶**Communist Curbs**—Since agreement by the occupying powers provides that only airlines of Britain, France, Russia and the U.S. may use the air corridors to Berlin, Lufthansa will not be able to fly into that city—at least for now.

It is not considered likely that the Russians, now sponsoring an airline out of the East Berlin airport of Schoenfeld (AVIATION WEEK Oct. 18, p. 114), will approve any change in this agreement, particularly since it would imply a recognition of West German sovereignty.

The East German line, using Russian-built aircraft, is operating between East Berlin, Warsaw and Budapest. It is expected to extend its operations to Prague, Moscow and perhaps such cities as Stockholm.

The Reds have refused to permit Scandinavian Airlines System and KLM Royal Dutch Airlines to operate into Berlin unless they use the Communist-controlled Schoenfeld terminal. Their attitude toward Lufthansa undoubtedly will be even sterner.

▶**Network Center**—Hub of the new Lufthansa network will be Rhein-Main Airport in this city, already the center for foreign airlines operating into Germany. Terminals here and at Hamburg, the nation's commercial center, are modern and efficient.

Once Lufthansa begins operations, probably by Apr. 1, SAS, KLM and Air France will abandon their domestic routes within West Germany. SAS, for example, has been operating a 10-plane DC-3 fleet among German cities.—**WJC**

Dallas Gains Support In Airport Dispute

The Dallas-Ft. Worth airport dispute (AVIATION WEEK Nov. 29, p. 77) took another turn as Dallas gained some qualified support from the Airport Operators Council in its Supreme Court fight with Civil Aeronautics Board.

Dallas has asked the Supreme Court to review its case against CAB over Central Airlines' service to Dallas-Ft. Worth. In the Central renewal proceeding, the Board granted the airline a route into Dallas and Ft. Worth but specified that both cities be served through the single terminal of Ft. Worth International Airport.

▶**'Arbitrary' Decision**—Dallas decided to go to court in an effort to nullify the decision.

The city contends CAB did not establish the airport as an issue in the case. The city claims it was denied its right to notice and hearing by the Board's "arbitrary" action. A lower court decided against the city last May.

▶**AOC Support**—The Airport Operators Council has filed a statement supporting a Supreme Court review of the controversy. The council does not take sides on the specific issue of the Ft. Worth airport; it believes the ". . . questions involved transcend any local disputes between the city of Dallas and the city of Ft. Worth.

"In the ultimate analysis they present the question whether, under the Civil Aeronautics Act of 1938, members of the general public are entitled to reasonably adequate and definite notice of the questions which are to be decided in route proceedings before the Civil Aeronautics Board to the end that they may decide whether or not they will become parties, what evidence they will introduce and how they will conduct themselves in other respects."

CAB Staff Helps Dutch Investigate DC-6 Crash

Two Civil Aeronautics Board staff members are expected to return from The Netherlands this week after lending technical assistance to the Dutch government in its investigation of the crash of a KLM Royal Dutch Airlines DC-6B in the North Sea in August. The crash killed all 21 persons aboard.

Leon H. Tanguay, chief of the Technical Division of the Bureau of Safety Investigation, and Martyn V. Clark, bureau aeronautical engineer, were sent abroad at the specific request of the Dutch government.

About 60% of the wreck of the DC-6B has been recovered and is being studied in Amsterdam. Part of the fuselage has been reconstructed with the aid of a representative of Douglas Aircraft Co.

Test Cell Contract

Contract for design of a new test cell at Arnold Engineering Development Center, Tullahoma, Tenn., to determine what happens when high explosive shells are fired into aircraft at high altitude and high speed has been awarded to McConathy, Hoffman & Associates, Inc., New York, N. Y. Air Research and Development Command, in announcing the project early this month (AVIATION WEEK Dec. 6, p. 21), erred in identifying the designer.

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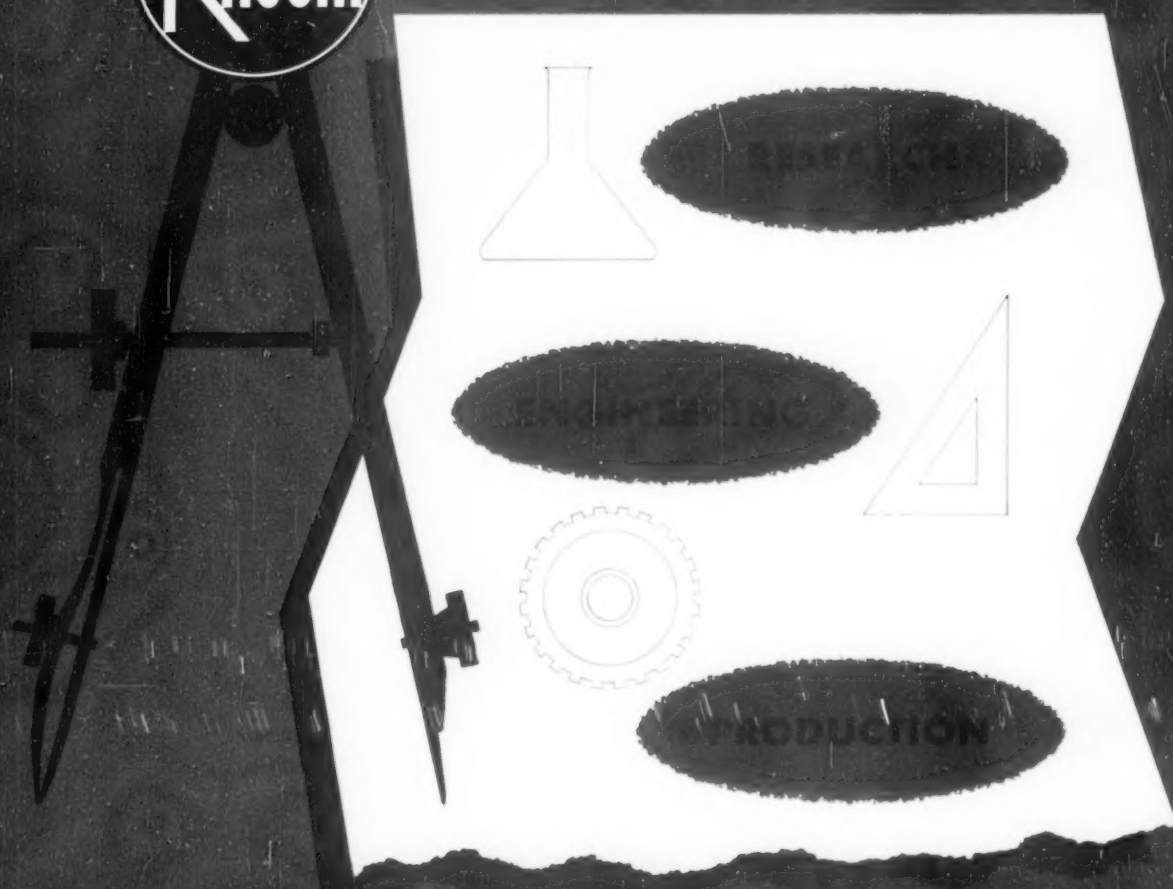

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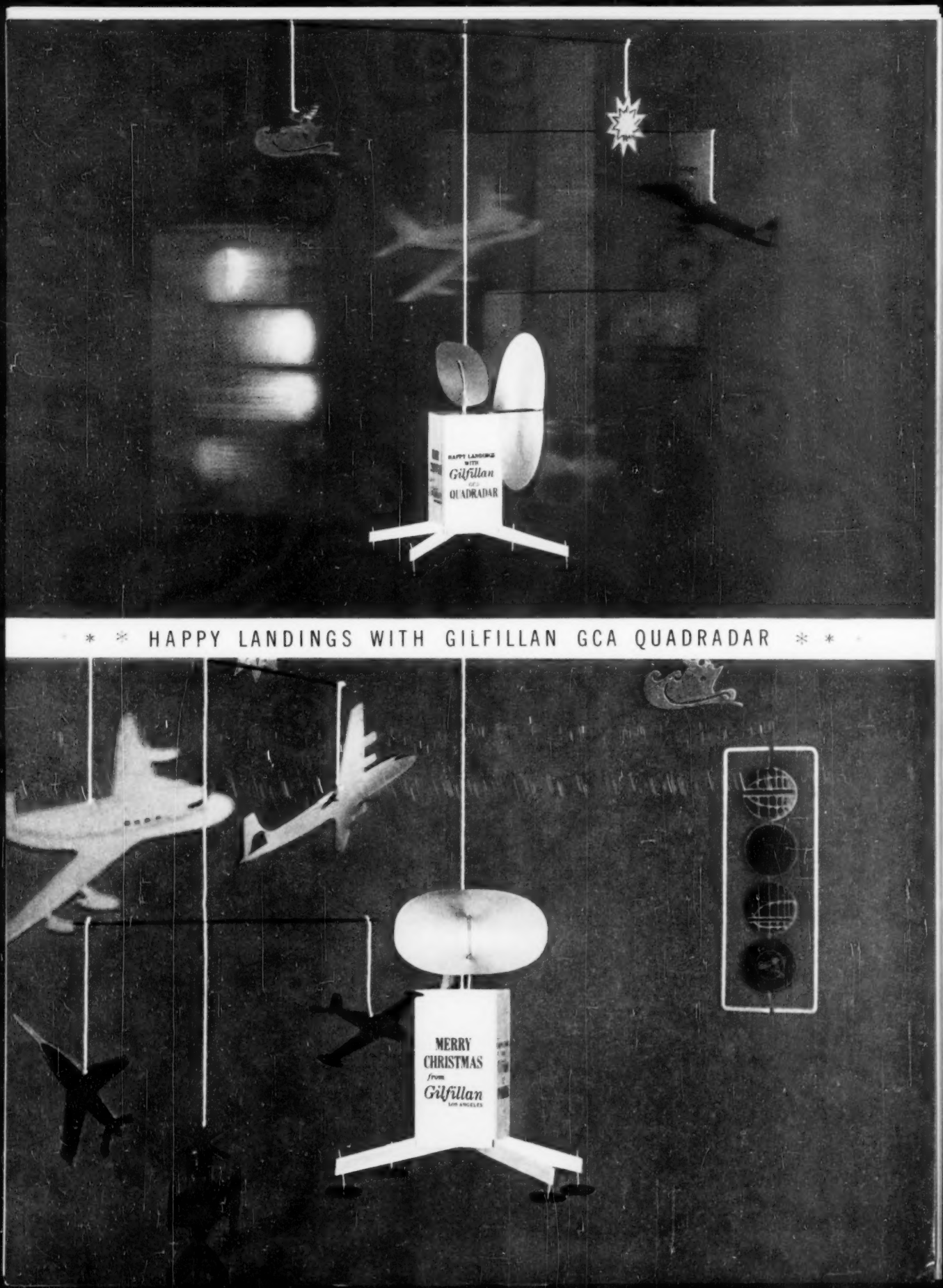
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SAS Sees Swing to Polar Flight

Airline reports early over-the-pole service is below break-even, but expects increase during tourist season.

By William Coughlin

Copenhagen—Scandinavian Airlines System has combined new polar navigation techniques with the reliability of Douglas DC-6Bs to pioneer a commercial air route across the top of the world that soon will be followed by other major airlines.

Early acceptance of the new twice-weekly transpolar flights has been good, SAS spokesmen report, with load factors up to 50%. This, however, is under the break-even point for the 32-passenger DC-6B Royal Viking transports.

▶**Northwest Passage**—Low load factors were expected during the first winter months of the new service and SAS is confident traffic will climb rapidly with the approach of the tourist season. Travel agents already have reported a number of customers switching bookings to the new over-the-pole route.

Beginning with its first Los Angeles-to-Copenhagen flight on Nov. 19, 1952, SAS has carved its own "Northwest Passage" from the cold northern skies. Over the Skagerrak Sea, above the bleak polar ice cap of Greenland, down across Hudson Bay and the cold north country of Canada lies a new route that brings Europe and the U.S. west coast a thousand miles closer together.

It makes Los Angeles a "gateway to Europe" and this Danish city a "gateway to California."

▶**Direct Service**—Trans World Airlines and Pan American World Airways already have shown interest in the trail-blazing efforts of the modern Vikings. Economy in time and distance can be achieved in polar routes between Europe, the U.S. and Asia.

"SAS believes that the route across the Arctic for many reasons possesses great possibilities," says K. Hagerup-Svendsen, vice president-operations. "People on the American west coast will get a direct service to Europe, passengers avoid tedious aircraft changes in New York, and last but not least, the route has a great touristic value."

▶**Trial Flight**—U.S. newsmen on the inaugural flight from California to Denmark Nov. 15 were treated to the precision polar flying and deluxe service with which SAS hopes to lure passengers from more conventional and less romantic routes.

The Royal Viking lifted from a foggy Los Angeles International Airport at 22 min. past midnight and arrived at Winnipeg, Canada, 5 hr. 50 min. later in clear but cold weather. At the controls for the first leg of the inaugural flight was Swedish Capt. Sven Gibson.

Interiors of the DC-6Bs used on the transpolar route have accommodations for 32 passengers and a crew of 10. There are eight berths available in the aft section and 24 forward "dormette" seats that may be lowered to full reclining position.

▶**Polar Path Compass**—After a brief stop at Winnipeg, the DC-6B headed northeast for Bluie West Eight (BW-8), 2,000 mi. away on the west coast of Greenland, with Capt. Ferdinand Buck, 32, ex-Norwegian Royal Air Force flyer, in command.

Flying at 17,000-ft. with the outside temperature at −25F, the Royal

Swiss Test New Antiaircraft Missile

New version of the Oerlikon antiaircraft missile is shown during recent tests of Tschamut in the Swiss Alps. Delta wings replace the trapezoidal surfaces of the original layout (Aviation Week, Sept. 17, 1951, p. 18) and small sweptback fins have been added near the tail. Launcher design has been cleaned up. Manufacturer of the missile, Oerlikon Machine Tool Works, Buehrle & Co., of Zurich, says the Swiss Army will have priority on production missiles, but that "any Western country" may buy units. A batch of 25 has been tested in the United States at the Holloman Air Development Center of the Air Research and Development Command, USAF. Guidance of the earlier model was beam-rider with a reported range of about 12 mi. No other details are available.

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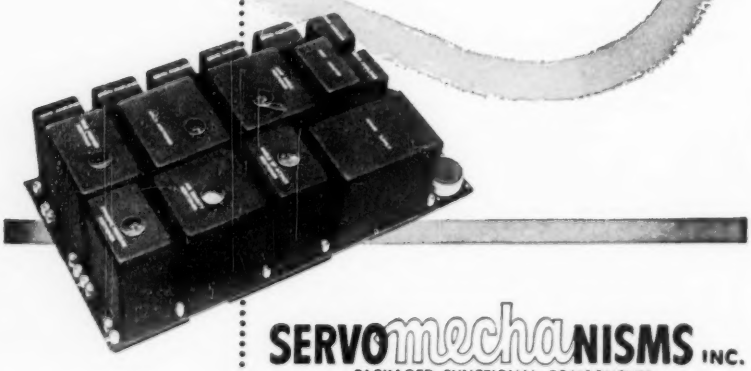

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Viking droned north over Hudson Bay and crossed the Arctic Circle at 2:32 pm EST.

Here, approaching the North Pole area, the crew of the aircraft began to rely on its Polar Path compass, developed by the Eclipse-Pioneer Division of Bendix Aviation Corp., and upon a new navigational system and chart.

Navigation in the Arctic is plagued by two problems:

• **Convergence of lines** of longitude at the Pole. This was solved with a so-called grid navigation system in which the navigator calculates all courses from a single longitude, the Greenwich meridian.

• **Magnetic compasses spin** in the vicinity of the North Pole. This problem was less simple. To solve it, Bendix developed the Polar Path compass, a gyro compass whose random drift is less than one degree per hour and whose precession due to rotation of the earth is compensated for automatically by a device within the compass itself.

▶**Airborne Radar**—During the winter months, SAS also can rely on celestial navigation, since its navigators will be able to take fixes on the stars. During the coming summer months of daylight in the Arctic, only the sun will be visible, however. Then the Polar Path will be of even more importance.

Airborne radar, using longrange navigation systems, such as Loran or Consol that employ a network of ground stations for guidance, still is in the future.

The inaugural flight landed at the cold and snowy USAF base at BW-8, 7 hr. 33 min. after departure from Winnipeg. After another brief pause for refueling, the Royal Viking climbed away from the Greenland base and set out on the final leg—2,162 mi. to Copenhagen.

Weather in the Arctic usually is much better than that of the North Atlantic area. A stationary high extends from eastern Alaska to northern Greenland throughout most of the year.

▶**Polar Meals**—Col. Earl Spencer, commanding officer at BW-8, says the base has "some of the best flying weather in the world." It is below minimums only 2% of the time, he reports. Nevertheless, the Air Force has one of its best GCA teams stationed at Sondre Stromfjord and SAS crews are experienced in GCA landings.

No account of the SAS flight would be complete without a comment on the menus.

A typical meal includes Russian caviar and goose liver, cream of mushroom soup, roast wood grouse, cheese and crackers, dessert, and cafe avec. The meals are accompanied by aperitifs, champagne, fine white and red wines, after-dinner liqueurs and brandies. There

Facts about *HELICOIL* inserts in the aircraft industry

What they are

*Heli-Coil** screw thread inserts are precision-formed coils of stainless steel or phosphor bronze wire. Wound into tapped holes, they form permanent non-corrosive, strip-proof threads of astonishing strength.

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Threads tapped in aluminum or magnesium when protected by *Heli-Coil* inserts are much stronger, therefore you can use smaller, fewer, shorter cap screws for required strength. Fewer or shorter cap screws mean savings in fastening-weight, through lighter bosses, thinner flanges, and thinner wall sections.

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AS ORIGINAL COMPONENTS: *Heli-Coil* inserts are used to provide stronger, lighter fastenings, corrosion-proof, wear-proof, threads in all assemblies. Thus you find *Heli-Coil* inserts throughout aircraft engines, airframes, and accessories, from the heart of jet engines to skin inspection panels.

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Holes are drilled and tapped as you do for ordinary threads—then *Heli-Coil* inserts are wound into tapped holes by hand or power tools. Install in a few seconds, assure thread protection forever. Can be used in any metal, wood or plastic.

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After a flight over the polar ice cap of Greenland, which at times rises to an altitude of 9,000 ft., the SAS Royal Viking touched down in brilliant sunshine at Kastrup Airport at Copenhagen, just 23 hr. 56 min. and 5,800 mi. after departing Los Angeles.

▶**Fares**—Despite a ground delay for ceremonies at BW-8, Capt. Buck had picked up an hour by going around the bottom of a low pressure area, passing directly over Iceland, and then swinging north of course to catch a tailwind.

Enroute between Greenland and Denmark, the Royal Viking had passed far to the south of the first westbound flight for California.

One-way fare between Los Angeles and Copenhagen, London or Paris will be $574.70; roundtrip fare will be $970.60 between November and March, $1,047 April through October. Fare for passengers to or from San Francisco and San Diego will be the same as Los Angeles.

▶**SAS Routes**—Following the inaugural transpolar flight, SAS took U. S. newsmen on a tour of some of its routes in Europe, to help dispel the notion that SAS serves only Scandinavia.

In fact, SAS is one of the world's most extensive airlines. More than 90% of its operations are outside of the Scandinavian countries. It serves Africa, Japan, South America, India, the Philippines, Hong Kong and New York.

The transpolar newsmen visited the Swiss Alps, the ancient ruins of Rome, wineries in the Rhine Valley near Frankfurt, and enjoyed the nightlife of Paris, all on SAS routes. The line serves 48 cities in Europe, more than any other tran-Atlantic airline.

Its routes cover 92,603 miles, linking 69 cities in 35 countries on five continents.

SAS also operates a 10-plane feeder system within Germany with its DC-3 equipment.

Although all of the airline's long-distance flights are first-class, about 50% of its routes, particularly in Europe, are tourist. In the European style, it flies both tourist and first-class on the same aircraft on some routes.

▶**Equipment**—SAS operates a fleet of more than 60 planes, including 14 DC-6Bs, 12 DC-6s, 9 DC-4s, 17 DC-3s, six Scandias and two JU-52s. It also has placed a large order for Douglas DC-7Cs, with first delivery due in the summer of 1956. It employs 400 pilots.

Company officials report that SAS has purchased $100-million in aircraft and related equipment from Douglas Aircraft Co., operating the largest Douglas-built fleet outside of the U. S. SAS estimates it has sold $50-million in tickets to American citizens.

▶**Merger Pact**—Original merger agreement joining the Danish, Norwegian and Swedish airlines into SAS was signed on Aug. 1, 1946. Complete merger of the three airlines took place in 1951 with the signing of a new 25-year agreement. Sweden controls

Helicopter to the Rescue

An ill-fated Cessna L-19 Army liaison plane that crashed on a difficult-to-reach sandbar is brought back speedily to its home field, suspended by a sling attached to a big Piasecki H-21C copter. The copter carried the necessary salvage crews to effect the rescue.

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Valve Talk

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by Marvin Miles,
Senior Member, Aviation Writers Assn.

Recently there came in the mail a most gracious letter from a woman aircraft worker who asks about the "little cogs" in the industry.

"As the operator of a drill press," she writes, "I only see the parts, hundreds of different kinds, and it's hard to visualize them being a part of the streak of speed that zips across the sky ... Everyone, regardless of paycheck size, likes to feel that his efforts are appreciated ..."

In writing about airplanes and flights, pilots and engineers, business problems and new developments, it's far too easy to forget the "little cogs" as she calls them. Yet where would the industry be without them, these hundreds of thousands of workers whose myriad routine tasks evolve eventually into completed aircraft?

Just because they are legion, because their individual jobs do not require long training and infinite skill, does not mean they are not important. Nor does the fact that they can be replaced more readily than higher paid personnel detract one whit from the vital nature of their work.

It's the job, and how it's accomplished, that counts.

A drill press operator, for instance, has a basic role in aircraft production. So have scores of others, the riveter, the spot welder, the tube bender, the coil winder, the painter, the wire worker, the wrapper, the numbering machine operator, all the many categories wherein specific tasks contribute their share toward perfection.

Offhand there would seem to be little glamour in the great variety of jobs that keep the big plants ... and the small ones, too ... bustling with production. But if you break down the noisy, helter-skelter scene and trace it backward from roll-out to the very beginnings, you come up with a magnificent picture of achievement wrought by multitudes of men and women, most of them "little cogs."

It's difficult, perhaps, for a production worker to appreciate his part in this amazing industry. He may feel his job is dull and unimportant, that he's just a number, a statistic, like the parts that pass through his hands.

Yet he has only to realize that without his work the airplane would not be complete. It makes no difference that someone else could do the same job as well. The important thing is that he, himself, has a personal share in "that streak of speed that zips across the sky."

By and large he is proud of his individual contribution, proud of the sum total of thought and labor all around him that can produce the planes, the engines, the accessories and the equipment upon which this nation may depend for its very existence.

A Pollyanna attitude? Not on your life. Someone has to do each job and do it right, large or small. And to do it right requires the craftsman's pride in accomplishment. Sure, there are sometimes scoffers who deride vision and imagination in those who can see the real value of their work, no matter how prosaic. But they're likely hiding their pride under a cloak of assumed callousness or urbanity. Either that, or they don't fully discern the importance of their own roles on the industry's vast stage.

And because the commendations and the praise fall on the executives, the designers, the pilots, there is no reason why they should not mantle the "little cogs" as well, for without them there would be nothing to praise.

Though perhaps the day-by-day work of these hundreds of thousands goes unheralded in the large sense, there is in fact a strong, deep-felt appreciation for their effort and their dependability — in the military services as well as in the industry's management levels where pride in personnel is no small thing.

Whittaker salutes the "little cogs" that keep the big wheels turning!

three-sevenths of SAS, while Denmark and Norway each hold two-sevenths.

Operations of the airline are not subsidized. Each nation's participation consists of 50% government investment and 50% private capital. SAS is run by a board of directors made up of two representatives from each country, with the chairmanship rotating yearly among the three nations.

It is an unusual demonstration of international cooperation, particularly when it is realized that national pride and competition among the three countries runs as strongly as that of, say, California, Texas and Florida.

► **Oldest Airline**—SAS claims its Danish partner (DDL) as the oldest existing air transport company in the world, founded Oct. 29, 1918, operating regular service between Copenhagen and Warnemunde, 100 mi. distant, with a Friedrichshafen hydroplane. Sweden's ABA began operations in 1924 and Norwegian DNL in 1927.

SAS runs its own maintenance base at Kastrup Airport here in Copenhagen. It has repair and maintenance contracts with a number of European nations and handles jet aircraft repair and overhaul work for the NATO countries. SAS also holds an overhaul contract for U.S. Air Force DC-4s in Europe.

The company is actively at work on plans for another polar route, linking Scandinavia and Japan via Alaska.

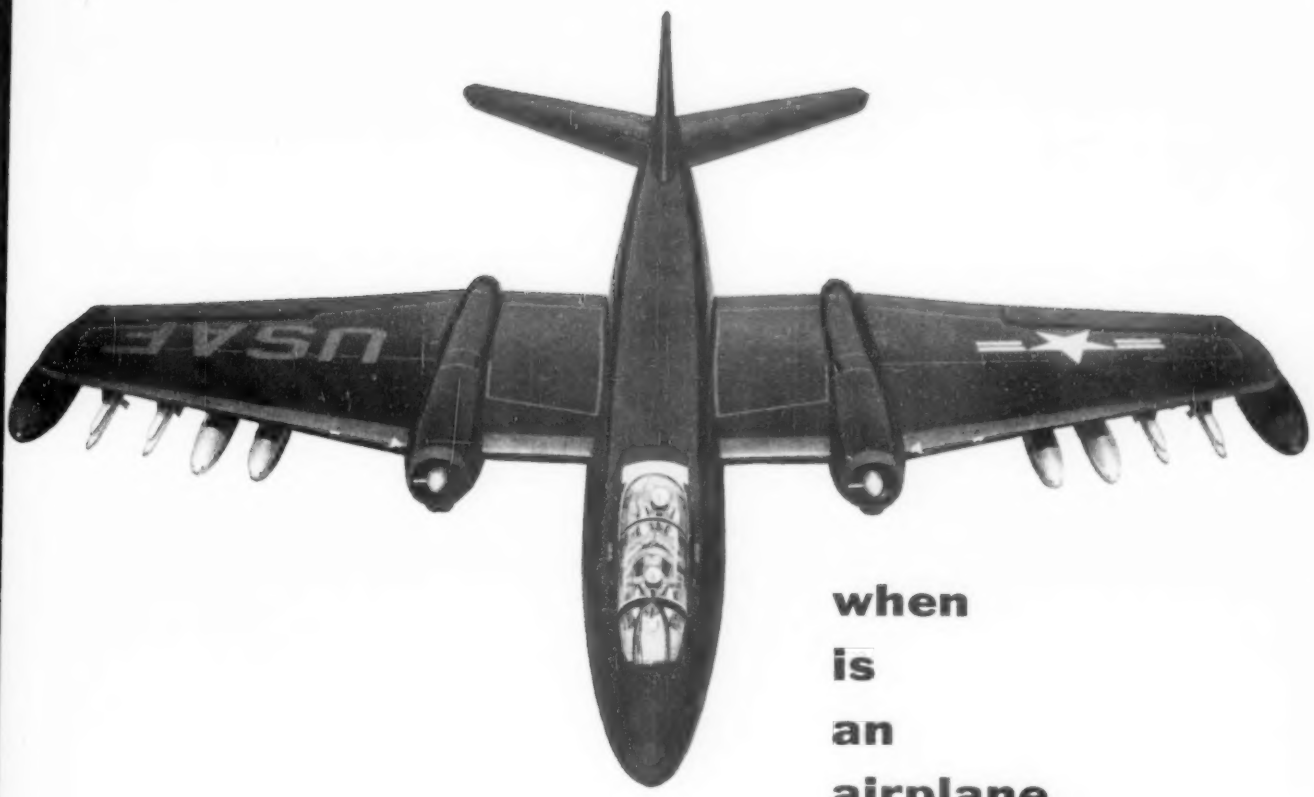
Catalina Suspension Gets CAB Approval

Catalina Air Transport has obtained permission from the Civil Aeronautics Board to suspend service temporarily between Santa Catalina Island and the California mainland. In September, CAB denied Catalina authority to suspend service, but now has reversed itself in granting a suspension.

In applying for reconsideration of the earlier CAB decision, Catalina pointed out that it has no personnel or operating equipment with which to run the service and has been unable to make a deal with another carrier to provide it.

► **UAL Operation**—Catalina hasn't operated the route since 1942. United Air Lines took over the route authorized by Catalina's certificate in 1946, operated it under a contract that terminated Nov. 1, 1954.

When United's contract ran out, Catalina wanted a temporary suspension until spring, arguing it could not reinstitute service immediately without equipment or personnel. First the Board told Catalina it had to start operating Nov. 1, but the subsequent decision allows the carrier to suspend service until it is prepared to operate again, but not later than May 1, 1955.



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...When it is a "pilot's airplane", essentially simple and easy to fly.
...And finally when it's out of engineering and in the air—when it's being delivered and in operation.

The Martin B-57—brilliant new member of the Air Force's family—is in truth a great airplane. Low wing loading gives it take off and high altitude performance characteristics exceptional in the reconnaissance bomber class, and the Martin rotary bomb door makes it capable of both high and low-level bombing runs at fighter speed.

Basic configuration changes now make possible adaptions of the USAF B-57 to cover a wide variety of critical missions.

But for the final word on this remarkably versatile airplane—ask the man who has flown one.

You will hear more about Martin!

MARTIN
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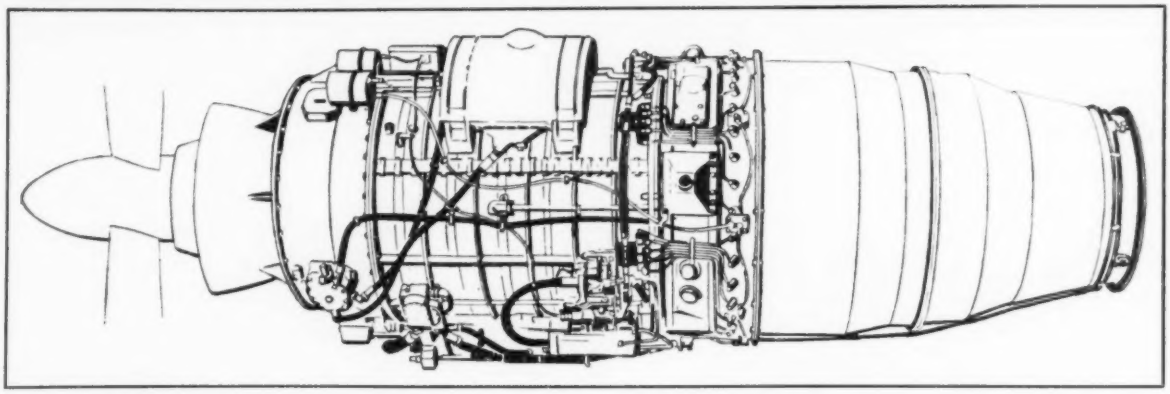


DERATED TURBOPROP based on Wright's 10,000-eshp. T49 (Aviation Week drawing above) would produce 6,000-6,600 eshp.

Wright Pushes 'Supercharged' Turboprop

Hurley says derating the military T49 would provide airlines with powerful constant-output engine at slight development cost and time.

By Irving Stone

The derated turboprop engine is advanced by Roy T. Hurley as the logical powerplant to speed development and operation of turbine-propeller-powered commercial transports in this country.

Hurley, president and chairman of the board of Curtiss-Wright Corp., told AVIATION WEEK that studies at the company's Wright Aeronautical division indicate the feasibility of using a derated version of an existing high-power turboprop engine in planes such as future models of Lockheed Super Connie and Douglas DC-7 series.

▶ **Benefits of Derating**—The derated version of a high-power turboprop is seen offering these advantages:

- **Constant power** availability from sea level to operating altitude.
- **Increased block speeds.**
- **Increased revenue** ton-miles per year.
- **Big saving** in development costs usually involved in bringing an engine from scratch to a status comparable to that of the derated existing turboprop.
- **Relatively early availability.**
- **Increased reliability** and durability.

▶ **T49 Studies**—Wright's studies obviously refer to a derated model of the T49, the military turboprop based on the company's J65 turbojet. More than 3,000 of the J65s have been built.

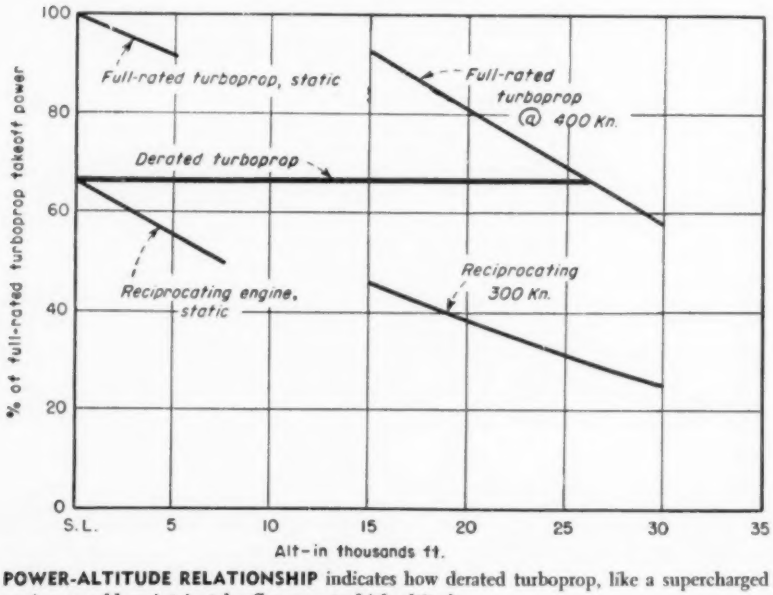
AVIATION WEEK revealed the installation of the T49 in Boeing's XB-47D, in combination with the General Electric J47, the plane's normal powerplant (Apr. 19, p. 14).

Full rated power of the military T49 is approximately 10,000 eshp. The derated version for commercial application initially would be in the band somewhere between 6,000-6,600 eshp. From this derated value, the engine would have a growth potential up to its full rating; but this, of course, would mean some redesign or modification of the airframe using the engine to take this additional power.

The derated version of the T49 probably could be ready for delivery for airline use in 1958.

▶ **Constant Power Advantage**—Wright engineers point out this philosophy in advancing the use of the derated turboprop for commercial transports:

With the conventional turboprop engine, designed for a certain top power which it is expected to use at takeoff, the horsepower falls off with altitude as a result of reduction in air density. It would be desirable to take off with a power value which reasonably could be maintained over a fairly wide altitude range.



POWER-ALTITUDE RELATIONSHIP indicates how derated turboprop, like a supercharged engine, would maintain takeoff power to high altitude.

Starting with a high-power turboprop—a military engine, for example—and derating it to a desired power value results in a horsepower vs. altitude graph which is essentially similar to that obtained with airline supercharged reciprocating engines in use today.

Thus, if a turboprop that is initially designed to deliver about 10,000 hp. at takeoff, is actually called on to provide only two-thirds of this power—6600 hp.—the air-handling capacity of the basic full-rated engine will permit the 6,600 hp. to be maintained to an altitude which will allow complete utilization of the aircraft's speed capabilities at that height.

▶ **'Supercharged' Turboprop**—In effect, the result is a "supercharged" turboprop with more takeoff capability than required. This means that a smaller, lighter gearbox may be used, coupled to a lighter propeller.

It is estimated that the lighter reduction gear in the derated engine will pare about 13% from the weight of the full-rated engine gearing.

Another big advantage seen for the derated turboprop is on hot-day takeoff, a condition which normally may be critical for the conventional turboprop or turbojet.

With the derated turboprop, the throttle could be advanced to obtain the rated horsepower, despite outside temperature effects; with the conventionally designed engine, opening the throttle full affords less than the sea level rating on that same hot day.

▶ **British Activity**—The principle of the derated or supercharged turboprop is not new. British engine designers have been working along these lines for some time.

Bristol Aeroplane Co. Ltd.'s B.E. 25 (AVIATION WEEK Oct. 25, p. 13) is in effect a derated engine, with a large air-handling capacity not actually needed until altitude is reached. Slated for the Bristol Britannia transport, the engine is targeted to maintain about 5,000 eshp. to more than 20,000 ft. of altitude.

Because the B.E. 25 is a "design from scratch" powerplant, it is likely that weight refinement has brought savings which would not be readily available in the normal high-power turboprop derated for transport service. However, a derated engine could be refined to save weight, if commercial sales warranted this additional development expense.

Another British supercharged turboprop engine under development is a Rolls-Royce powerplant with a 4,500-eshp. rating maintainable to about 20,000 ft. (AVIATION WEEK, Dec. 6, p. 11).

▶ **Lower Heat, Stresses**—The high-power turboprop derated for transport service will have increased durability, hence longer engine life. This results because derating is accomplished by operating the engine at a lower temperature—perhaps in the region of 300F less than that of the full-rated engine.

This would indicate that savings in critical, high-temperature alloys could be obtained with the derating scheme. But it is not likely that this approach would be followed, because of the desire to retain a high safety factor and to eliminate high re-development costs involved.

The derated engine also would be operating at lower stress levels—an important factor in engine reliability.

▶ **Prop Modification**—Still another dividend is that propeller activity factor and noise level could be reduced. This would be accomplished through modification of blade form and tip speed.

This propeller change is deemed justified on the basis that, in the derated engine, it is not necessary to squeeze the ultimate efficiency out of the prop.

The propeller for Wright's version of the derated turboprop already has been built and is on test for this application.

The smaller, lighter gearbox for the engine now is in the design stage.

Roy Hurley States . . .

Case for the Derated Engine

New engine development has proved to be a very expensive procedure, with long periods of the time involved and many troubles to be solved before operating hours are accumulated.

Roy T. Hurley, president and chairman of the board of Curtiss-Wright Corp., in an exclusive interview with Aviation Week, has emphasized the feasibility of the derated turboprop for transport use.

Hurley points out that if a new engine were designed today it would have the same general characteristics as the derated turboprop. In effect, this opens a new approach to engine design, one stressing the economic viewpoint rather than an endeavor to operate at near maximum efficiencies.

As Hurley sees it, the engine builder always has been pressed for more power by the airframe builder. Now for the first time, there is an excess of power available—more than actually is needed. For this reason, a little less propeller efficiency might be accepted for quieter operation, lower engine operating temperatures used, with lower stress levels and lower costs because of improved reliability and increased payload capacity.

Hurley points out that thus far Wright's derated turboprop study has been limited to the economics of a plane (such as one of the succeeding aircraft in the Super Connie and DC-7 series) using such an engine, and the essential changes involved with the powerplant.

Performance looked for, Hurley says, is a block speed in the neighborhood of about 450 mph. for an across-country time of under six hours. The plane with the derated turboprop also would be suitable for transocean flying—for distances of 3,600-3,700 mi.

Altitude recommended is between 25,000 and 35,000 ft. The plane designer should be cautious in going to high altitude—not reaching for the ultimate too soon. Hurley believes that altitude increases should be taken in reasonable steps.

HURLEY

The derated turboprop, he says, could easily and efficiently be tailored to existing airframes, with a minimum amount of risk to the operator in the way of reliability.

The engine may introduce about 200-250 lb. increased weight per engine installed, but this would be offset by the higher speed and shorter flight time, Hurley contends. In addition to the speed dividend, there would be a major increase in revenue ton-miles per year, which means more profit for the operator, he points out.

Modification of the wing, or a new wing, would be necessary to take care of the higher power and refinement necessary for higher speeds.

A new nacelle would be required, but the diameter of the derated turboprop could be accommodated in that required for the existing Wright Turbo Compound engine, now in wide transport service.

Engineers Get Key Jobs, Survey Says

The engineer is a leader in industry, active in community affairs and interested in the classical arts, says Stevens Institute of Technology as a result of a survey of that college's 5,300 living alumni.

A total of 67% of Stevens graduates are now in policy-making or decision-making posts in industry, the survey shows. Limited to the graduates who have been out of college for five years or more, that percentage jumps to a value of 78%.

Stevens says its figures confirm other recent surveys which have shown an increasing number of engineers called on to fill top industry jobs.

▶ **Other Jobs**—Almost one-fifth of the graduates are working and doing well in fields remote from engineering, such as banking, finance, insurance, law, medicine, dentistry and the clergy. Even though this group makes little use of its engineering education, almost all of its members say that if they had it to do over again, they would attend an engineering college. The approach they learned to analyze problems has proven useful in their chosen profession, they say.

A warning on the engineering shortage as it affects the newer industries such as aviation and avionics is contained in the survey.

Says the report, "New industries do not draw on the entire reservoir of engineering talent (even for supervisory personnel).

"Instead, they seem to depend largely on new graduates to staff their engineering and research departments. Therefore, as the supply of new engineers remains below the demand for the years immediately ahead, not all industries will feel the pinch equally.

"Those likely to suffer most are the newer industries, many of which rely heavily on engineers to develop new products and processes to make use of recent scientific discoveries."

▶ **Incomes Cited**—A year after graduation, 10% of Stevens engineers are earning more than $5,000 annually; after 15 years, 40% top the $10,000 mark. By retirement age, 39% of them earn over $20,000 annually.

About one-quarter of the group said they actively participated in music, drama, painting, sculpture or writing.

More than half the group said they take part in civic affairs, the Stevens survey reports.

Double-Shell Hull Called Noise Shield

A double-shelled fuselage may be a design feature of future commercial air transports, say Douglas Aircraft Co. engineers M. M. Miller and Raymond Pollock.

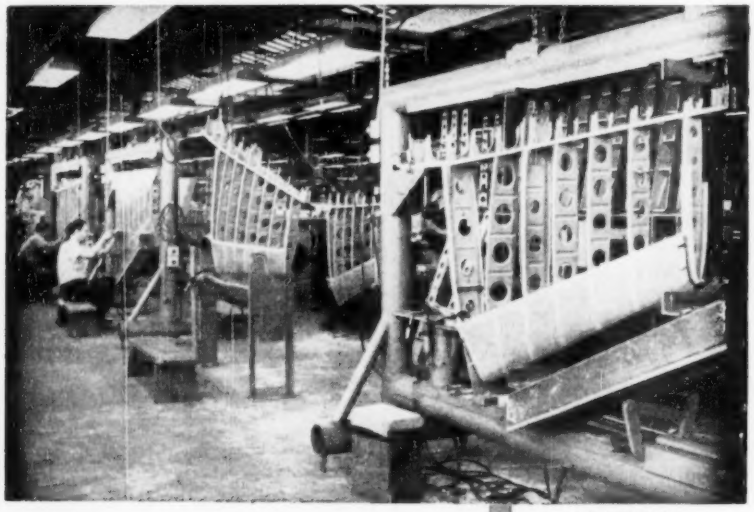
Major reason for the unusual design is noise reduction, the two Santa Monica division engineers told members of the Acoustical Society of America at the 48th annual meeting at the University of Texas.

▶ **Excessive Noise**—The Douglas duo claims that noise tolerance limits for the passenger will be exceeded if preventive steps are not taken in the structural design of the cabin. Available evidence indicates that there will be no significant reduction of noise at the source.

Thus, the attack on the problem must center around the fuselage for the moment, say the engineers.

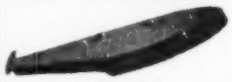
Douglas had designs and patents on double-shell structure for the DC-3, but never tried the idea because production costs, detail design difficulties and the extra weight added overrode the real need for the design at that time.

The engineers said that noise reduction, bought for the lowest possible price in weight, presents an expensive and challenging problem for the aircraft industry.



Above F-84 fins and rudders by EDO

A FEW EXAMPLES OF EDO CRAFTSMANSHIP



Famous EDO Seaplane Floats

USAF A-3 airborne lifeboat

Precision Radar Reflector

Electronic Cabinet

***Edo* means more than PRECISION WORKMANSHIP**

EDO Means *Design*, Too. Water plays no favors. Water leaks through any structure not precisely built. That's why making seaplane floats for 27 years has made precision manufacture of aluminum components a specialty at EDO.

Because of this unusual metal-working know-how, many manufacturers are turning their hard-to-make parts and sub-assembly problems over to EDO.

What's more, EDO's vast engineering staff, which has designed everything from complete aircraft to the Navy's latest sonar equipment can tackle problems right from the design stage, if desired.

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Take a tip! Always take off with the Flying Red Horse!

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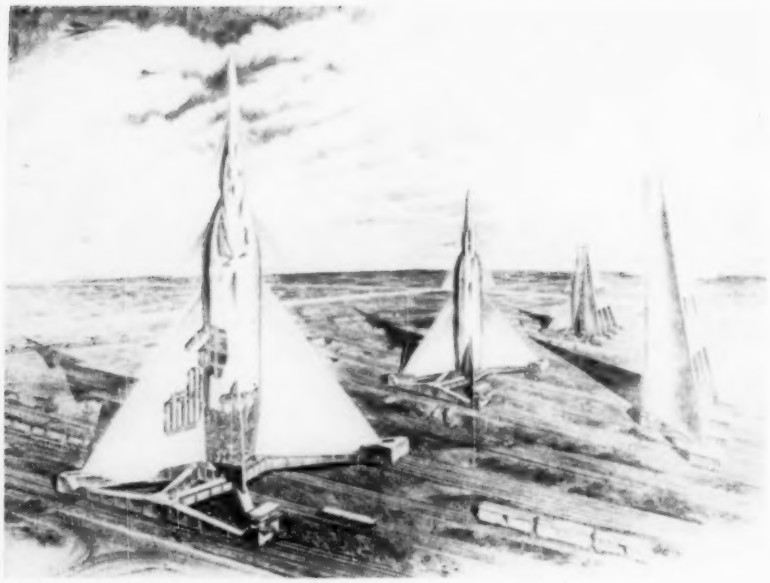


FIRST TWO STAGES of 3-stage satellite ferry would be piloted for recovery.

New Light Cast on Space Flight

By David A. Anderton

The ninth annual convention of the American Rocket Society outdid its predecessors, as planned. Held in conjunction with the American Society of Mechanical Engineers, it was bigger and better and the quality of the presentations was uniformly high.

During the three-day (Nov. 30-Dec. 2) meeting in New York, 34 technical papers were presented. In content, they covered the field, from component design to a cosmic concept for a three-stage satellite ferry vehicle.

Space flight attracted the most attention; two sessions were devoted to the subject.

Highlights from some of the many significant papers are presented in the following columns.

►A Preliminary Design Study of a Three-Stage Satellite Ferry Rocket Vehicle with Piloted Recoverable Stages—By Darrell C. Romick, Richard E. Knight and John M. Van Pelt, Goodyear Aircraft Corp., Akron, Ohio.

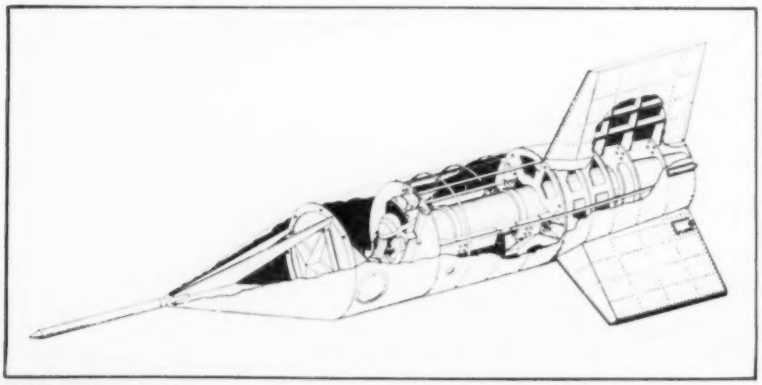
An unusual satellite system, in which the first two stages are piloted and can—after boosting the payload—glide to a landing at accessible airfields, appears to be a superior system for regular operation between Earth and a satellite orbit.

Each separate vehicle has delta wings and a set of nose doors which close after jettisoning of the stages ahead of it. The expended booster stage then becomes a glider and returns to a nearby base, where jet pods and other parts are installed for the flight back to the launching site.

In this, the longest and most complex paper at the ARS sessions, the authors do not recommend that work begin immediately. They emphasize that the current state of the art does not permit that to be done. They do recommend that studies begin, and tests be made on smaller scales, integrated into an overall program with space flight as a final objective.

Logistics and economics are considered for the system, and the data indicates that the system is superior to other earlier ideas in those respects. There is operational flexibility for inflight emergency, lack of which has been criticized in other proposals.

The finishing touch is a long-range research and development program, outlined in the presentation, for starting with unmanned vehicles and manned rocket research aircraft and ending with the data necessary to begin the big task.



CHEROKEE MISSILE was specially designed for highspeed tests of ejection seats.

►High-Altitude Launching of a Small Orbital Vehicle—By Kurt Stehling, Bell Aircraft Corp., Buffalo, N. Y., and R. M. Missert, University of Iowa, Ames, Iowa.

A large plastic balloon is proposed as a carrier for the launching of a three-stage satelite vehicle carrying a 30-lb. payload.

The experience of the Rockoon launchings—Skyhook balloons and Deacon rockets—led the authors to look at a somewhat more sophisticated system for placing a small payload in a satellite orbit. The big saving is aerodynamic drag, because the actual launching takes place at 75,000 ft.

A three-stage vehicle could be built for an estimated 13,500 lb., and would establish the payload in an orbit at altitudes up to between 100 and 200 mi.

►Instrumentation for Space Vehicles—By George W. Hoover, Office of Naval Research, Washington, D. C.

"The general discussion . . . is concerned primarily with the utility of an unmanned earth satellite. Useful or not, I am sure of one thing—if we get an unmanned satellite, someone will soon decide to cut a hole in it, call it a cockpit, and stick a man in it. My main interest is to see that this is one cockpit that will be designed to consider the characteristics of the man before it is built, not afterwards."

With this provocative remark, Hoover led off with a discussion of some of the problems of manned space flight instrumentation.

Typical is the altitude problem. " . . . Will it be feet, thousands of feet, miles or some new dimension . . .?" There are three factors to consider: How will altitude be measured, how will it be indicated and with respect to what?

"I hope that some of you will start thinking about these problems now instead of waiting until necessity requires improved inventions."

►Hydrazine Logistics—Don W. Ryker,

THE Air Force is faced with an important need: a winged target which will simulate jet-fighter evasion maneuvers—provide realistic aerial gunnery training for pilots flying at near supersonic speeds.

Goodyear Aircraft, working closely with the Wright Air Development Center, has designed and built such a target: the 1400-pound all-metal target shown here, which combines the desired features of realism and returnability.

It can be drawn at high altitudes at speeds in excess of 500 m.p.h., offset to one side of, and as far as 2 miles behind, the tow ship.

It can be made to perform evasive maneuvers either automatically or by direct control from the tow plane.

It is equipped with landing skids and a cable-release device which permits repeated use until the target is "all shot."

It is an interesting example of the cooperation, design abilities and production skills which have made Goodyear Aircraft Corporation "The Team To Team With in Aeronautics."

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New kind of fuel level switch

Honeywell develops new use for tiny thermistor

Now the transistor, storied eliminator of vacuum tubes, must share the spotlight with another semiconductor—the thermistor.

The thermistor is a rugged, inert, ceramic-like resistor whose resistance changes precisely as the temperature changes.

Honeywell has put it to work in a new kind of fuel level switch.

The Honeywell Thermistor Level Switch has many uses. On the B-47, it acts as a high level switch to prevent fuel spillage. Whether in the air or on the ground, overflow is wasteful and extremely hazardous.

It can be used as a low level switch to automatically sequence fuel in center-of-gravity control operations, act as a safety switch to protect fuel pumps and operate a low-fuel warning light.

Potentially, thermistor-actuated devices can be used for temperature measurement, control and compensation, as time delay devices and for level sensing in any type liquid.

The Thermistor Level Switch has no moving parts and is, therefore, far less subject to mechanical failures than previously available switches. Sloshing doesn't affect it, it's simpler to install and it has a longer, more dependable life.

Write for full information on your business letterhead to Honeywell Aeronautical Division, Dept. AW-12-235, Minneapolis 13, Minn.

Quick facts about Honeywell's new Thermistor Level Switch

Complete Fuel Level Switch, including thermistor sensor, relays, bridge

Small sensor unit for use in fuel line. Relays and bridge are external

- Power source—28 V dc or 115 V, 400 cps
- Available in a variety of models
- Models are easily "customized" for a specific application
- Requires no vacuum tubes
- Requires no adjustment at time of installation
- Will meet requirements of applicable military specifications

MINNEAPOLIS **Honeywell**

Aeronautical Division

2600 Ridgway Road, Minneapolis 13, Minn.

Matholin Corp., Baltimore, Md.

Hydrazine, a rocket fuel usable either as a monopropellant or in combination with an oxidizer, is now available in tonnage quantities.

Until recently this versatile new chemical was produced on a small scale as a highpriced research item. Rocket scientists thought it would be a valuable addition to the program if it didn't cost so much, and the manufacturers thought it could be produced for less if there was a big sales potential. Neither side made a move for a long time.

Now Matholin has brought into production a commercial plant at Lake Charles, La., because of hydrazine's value to the rocket program and because of the commercial possibilities of the chemical.

Raw material position is good; there appears to be a lower future price limit of about one dollar per pound. It is shipped in 55-gal. drums.

Interstate Commerce Commission classifies the substance as a "corrosive liquid." Operators using the material should wear protective clothing, should flush the skin with water if there is any contact with hydrazine, and should remove and wash any clothing on which the material is spilled.

▶ **Methods for Environmental Testing Rocket Engines**—By Louis Muller and Eric Harslem, Reaction Motors, Inc., Rockaway, N. J.

What are the economics and methods available for simulating the various environmental factors affecting the performance of rocket powerplants? The authors consider temperatures between −100F and +200F, altitudes to 100,000 ft., and humidities to 100% as the useful range to study.

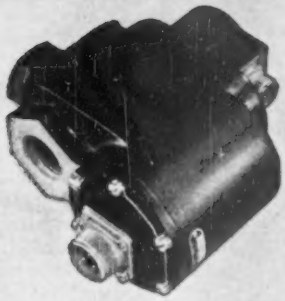
Liquid propellants require a conditioning unit specially designed, but solid propellants can be tested either in place, by using a cheap hot and cold chamber, or by using a conditioner unit.

Components for powerplants are separated into two groups. The commercial environmental chamber will handle one group, but the other—because of hazard or complexity—must be handled in special equipment, perhaps expendable.

Rocket engines can be handled in the same ways as components, but RMI experience shows that an expendable chamber used in conjunction with a propellant conditioner and a space conditioner is the most practical approach.

▶ **Supersonic Component Test Missiles**—By Donald L. Arenson, Ex-Cel Industries, Inc., and Harry Wiant, Cook Research Laboratories, Chicago.

Skokie and Cherokee are two missiles developed to test ejection seats,



The Flexbelt Valve may be used with an electronic control circuit. A two-phase servo-type motor drives the valve through a gear reduction including an overload clutch. An integral position potentiometer geared to drum provides an electrical indication of valve position for speed feedback control.

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Specific applications of the Flexbelt Valve include remote fuel flow control in aircraft fuel systems and control of maximum exhaust gas temperature by variation of fuel flow to a turbojet engine.

We believe our long experience, extensive facilities for developing, manufacturing and testing control system components for high-speed aircraft can be helpful to you. Our engineering counsel is at your service. We welcome your inquiry.

SPECIFICATIONS —
Flexbelt Valve Type 141VR

FLOW MEDIA: Water, gasoline, kerosene, oil, air, and gas. **FLOW MEDIUM TEMPERATURE:** Minus 65°F. to plus 250°F. **FLOW RANGES:** Up to 25 gpm of water at 25 psi pressure drop. **FLOW CHARACTERISTICS:** Linear, non-linear, logarithmic. **OPERATING PRESSURE:** Up to 1200 psi maximum. **OPERATING SPEED:** 3 seconds from full open to full close. **VOLTAGE:** 110 v. 60 cycles or 50 v. 400 cycles. **POWER:** 12 watts maximum. **POTENTIOMETER:** From 0–10,000 ohms in several sizes. **CONNECTORS:** AN3102-16S-5P for motor. AN3102-10SL-3P for potentiometer. **MATERIALS:** Housing — light weight aluminum; explosion-proof. Valve — aluminum and stainless steel. Flexbelt — Teflon-impregnated glass fabric; unaffected by aromatics in aircraft gasoline. Bearings — self-lubricating powdered metal. **WEIGHT:** 5 lbs. **SIZE:** 3" x 4½" x 4".

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parachutes and other components at high speed in free air.

Unlike most missiles, the requirements for these two test vehicles encouraged a high-drag design; after test equipment has functioned, the high drag aids the recovery of the missile for re-use because it slows the vehicle down.

Skokie 1 was an unpowered vehicle intended to test parachutes at high subsonic speed in free fall; a dynamic pressure of 400 psi. had to be simulated at 20,000 ft. altitude. Tests made with Skokie 1 verified sled tests made on parachutes, and served as a prototype of a supersonic powered vehicle.

Skokie 2 is powered with three 11,000-lb.-thrust Rato units. Air launched, it should reach about Mach 2. The design is still under development.

Cherokee was specifically designed for ejection seat tests, using a full-scale seat and dummy pilot at speeds up to Mach 1.5 at 20,000 ft. Power came from a solid-propellant rocket rated at 50,000-lb. thrust for three seconds.

Two tests have been made; both were air-launched, and in both cases, the parachute recovery did not work. But the desired seat ejection test was completed satisfactorily.

▶ Rocket Simplification With Multi-Function Components—By Bernard Ellis, Reaction Motors, Inc., Rockaway, N. J.

The rocket powerplant, originally starting out as one of the least complex units ever conceived, has suffered through the years from increasing complexity. This complexity is excessive in the majority of applications and reduces system reliability.

RMI has a program for system simplification by using multi-function components, built around these three principles:

- **Eliminate all unnecessary functions.**
- **Simplify the hardware** that is used to accomplish the remaining functions.
- **Eliminate parallel** independent functions in the procedure.

Following this program gets a designer into the position of specifying relatively unconventional systems for which there are no available components. In this field, there is a need for inventive genius applied to such problems as these: cooling, mixing, starting, pressurization, expulsion, pumping and gas valving.

▶ Development of a Stabilization System for the Viking Rocket—By N. E. Felt, Jr., Glenn L. Martin Co., Baltimore, Md.

Three separate sub-systems are required to solve stabilization problems of unusual near-vertical trajectory of the NRL-Martin Viking research rocket.

Motor control is used by altering the line of thrust of the rocket engine. Aerodynamic roll control uses movable tabs on two of the four fins. Small jet motors give a thrust reaction for control.

The first two systems were designed on the basis of frequency-response techniques, but the third required the use of automatic computers and non-linear systems.

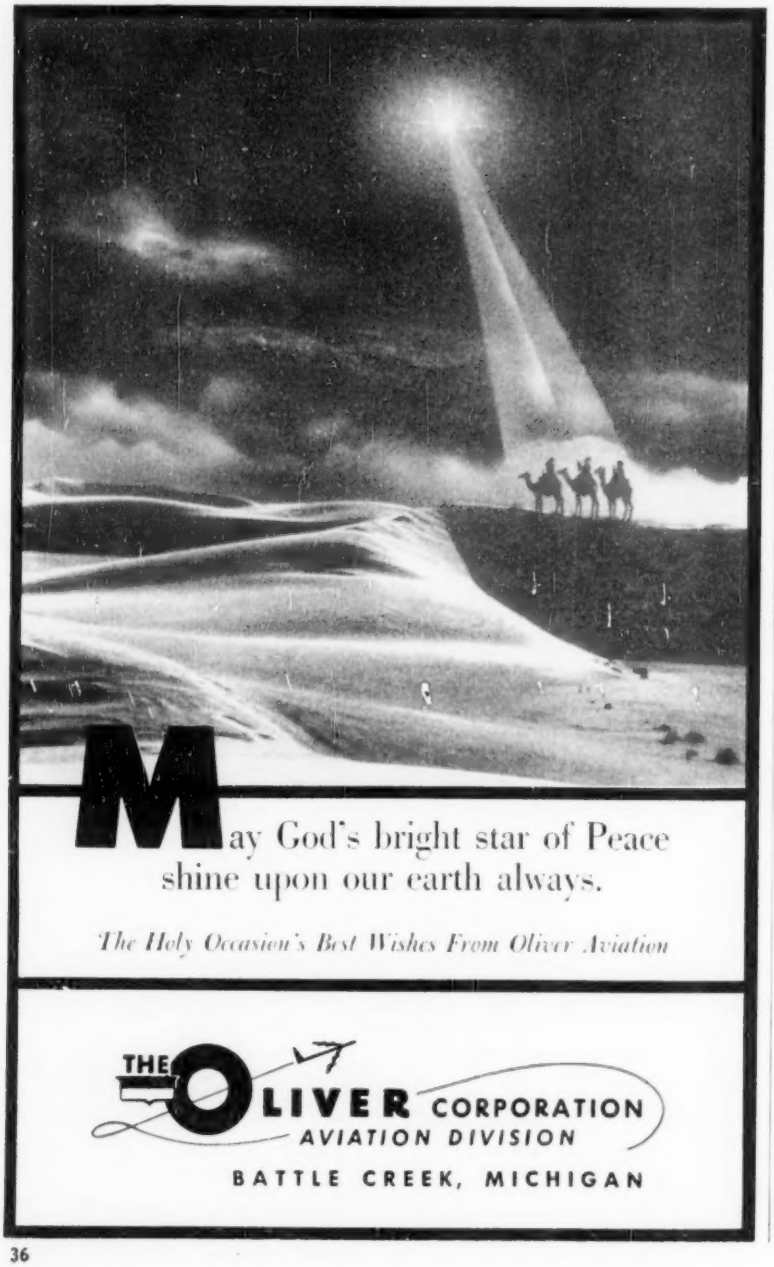
Martin says the basic approach was sound. But the first nine firings have shown the need for greater reliability, easier adjustment, and interchangeability, especially during the early phases of the program.

▶ Performance Analysis of Short-Range High-Velocity Ballistic Rockets—By W. O. Bergreen and L. M. Miller, North American Aviation, Inc.

The short-range ballistic rocket most commonly is applied to tactical missions in support of ground units. No guidance is used, the relative velocity between launcher and target is high, and there must be a short flight time.

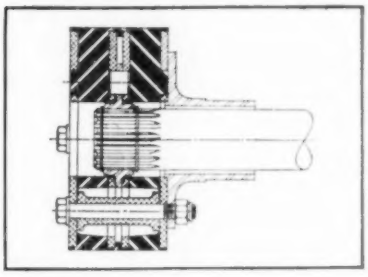
The specific application plays a large part in determining the optimum configuration, and the parameters which are normally important may not be important at all in this kind of rocket.

It is possible to eliminate drag terms in calculating time-to-target, and thus get near-optimum propulsion system


May God's bright star of Peace
shine upon our earth always.
The Holy Occasion's Best Wishes From Oliver Aviation
THE OLIVER CORPORATION
AVIATION DIVISION
BATTLE CREEK, MICHIGAN

Lord Flexible Coupling Flies With Kaman Helicopter

The Kaman K-5 helicopter presents an interesting application of the LORD J-5329-2 flexible coupling with the Boeing 502-2 gas turbine. The function of the coupling in this case is to absorb the torsional vibrations of the system and isolate the turbine from the rotors. However, the unit also serves to accommodate angular or parallel misalignments due to manufacturing tolerances or dynamic motions.



The unique design of the installation provides maximum accessibility and economical maintenance through the use of concentric driving and driven shafts. The inner member of this pair is the engine shaft which drives the coupling hub through a splined connection. Precompressed against the splined hub are the two bonded rubber coupling halves which transmit the engine torque in shear of the rubber. Four through-bolts connect the outer plates of the coupling halves to the driven hub and also serve as the safety interlock in case the rubber sections are destroyed. The first gear of the transmission is mounted on this driven hub and feeds power on through the system in to the helicopter rotors.

For over thirty years the Lord organization has specialized in designing and producing Bonded Rubber Flexible Couplings, Vibration and Shock Control Mountings and Component Parts. The capabilities of Lord Engineering have proved their worth to designers of industrial and automotive equipment in many diversified fields as is indicated in this instance.

(Advertisement)

ON LAND, SEA AND AIR

LORD *Flexible Couplings*

TRANSMIT THE FULL POWER OF BOEING TURBINE ENGINES

HERE again you see at a glance Lord versatility in designing bonded-rubber components for a wide diversity of machines. The photo at top right shows the Boeing Gas Turbine-Driven Truck-Trailer for heavy cargo hauling. At the top left you see a United States Navy personnel boat driven by the Boeing Gas Turbine Engine. Directly beneath is the Kaman Helicopter powered by the Boeing Gas Turbine Engine; details are clear in the foreground. The Lord Bonded-Rubber Flexible Coupling designed for the job transmits the power in each machine.

Special requirements like these reach satisfactory and economical solutions at Lord, Headquarters for Vibration Control. We invite you to take advantage of more than a quarter century of design experience and craftsmanship.

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LORD BONDED RUBBER

Headquarters for **VIBRATION CONTROL**

configurations even though the answers are not 100% accurate.

The specific application also affects the type of analysis to choose.

▶**Supersonic Research Sleds and Track Facilities**—By F. W. Thiele, North American Aviation, Inc., Downey, Calif.

The use of rocket-propelled sleds sliding on rails at high speed has been a highly successful test procedure. Full-scale test specimens can be "flown" through the transonic region to speeds as high as Mach 2.0.

Shells, rockets, ejection seat capsules can be fired out of moving vehicles under controlled conditions in any desired direction with respect to the path.

This paper surveys the types of sleds, powerplants and track facilities currently in use in the United States, and presents some of the general classes of tests and results from these tests.

▶**The Pogo Radar Target**—By Gilbert Moore, New Mexico College of A&MA, State College, N. M.

Pogo is a radar-reflecting high-altitude target for guided missiles, consisting of a parachute with a metallic silver coating and a rocket to carry it aloft.

Maximum descent rate does not exceed 1,500 fpm., and maximum drift speed rarely exceeds 100 mph. Thus it is nearly a stationary target, and considered as an addition to the target family, rather than a substitution.

Lockheed to Award Scholarships to 15

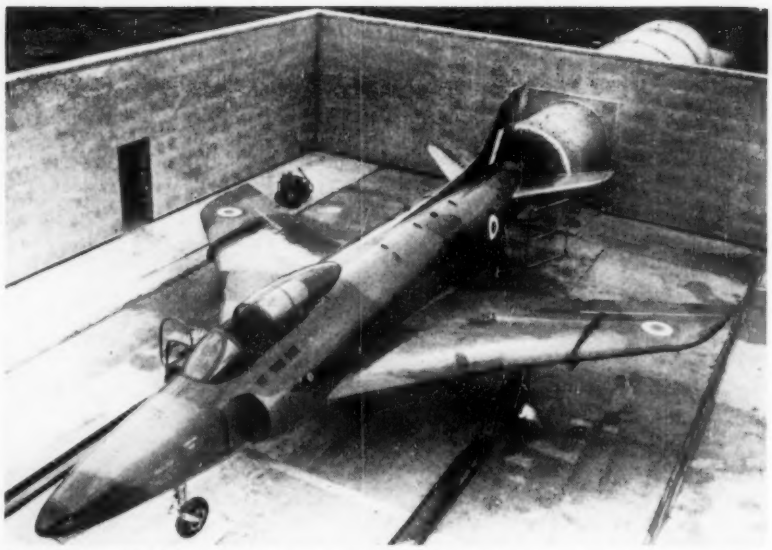
For the third year, Lockheed Aircraft Corp., will award four-year college scholarships to 15 high school seniors who want to study engineering or a business occupation applicable to the aircraft or missile industry.

Full tuition and fees plus $500 for personal expenses will be paid by the company to students with "demonstrated or potential leadership".

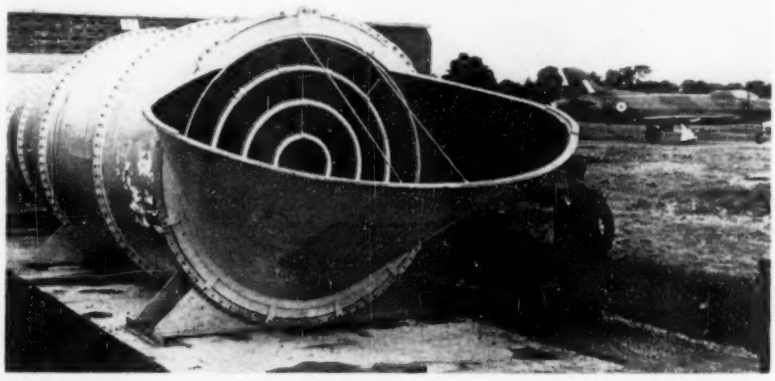
Ten of the grants are for engineering majors and the other five would apply to the study of business administration, accounting or industrial relations."

Scholarships are open at Massachusetts Institute of Technology, California Institute of Technology, Carnegie Institute of Technology, North Carolina State College, Rensselaer Polytechnic Institute, University of Michigan, Georgia Institute of Technology, Cornell University, Purdue University, Stanford University, Harvard University, Emory University, Pomona College, Northwestern University and the University of Southern California.

Each participating college will get a $500 grant from Lockheed to aid in administration of the scholarship.



SWIFT F.3 FIGHTER is backed up to engine silencer and secured by steel wires. Note Swift's compound leading edge sweep, vortex generators atop right stabilizer only.



UPSWEPT EXIT of jet engine muffler behind the pen sends dissipated sound skywards. When afterburner is not used, conversation is possible right up to the pen's walls.

Jet Muffler Hushes Swift Tests

"Remarkable success" is credited to a new outdoor muffler used by Vickers-Armstrongs, Ltd., to hush the roar of Swift jet fighters being run up on the ground prior to flight.

Conversation in the firm's South Marston factory previously was extremely difficult when the Swift's Rolls-Royce Avon was given full throttle. When the afterburner was turned on it became virtually impossible.

▶**Employe Reaction**—Following installation of the new muffler and plane enclosure, mostly negative replies were received when employes were queried about noise after the engine had been run normally. The noise heard after the afterburner was used was not associated with such a trial.

Vickers-Armstrongs is convinced that the noise level can be reduced further.

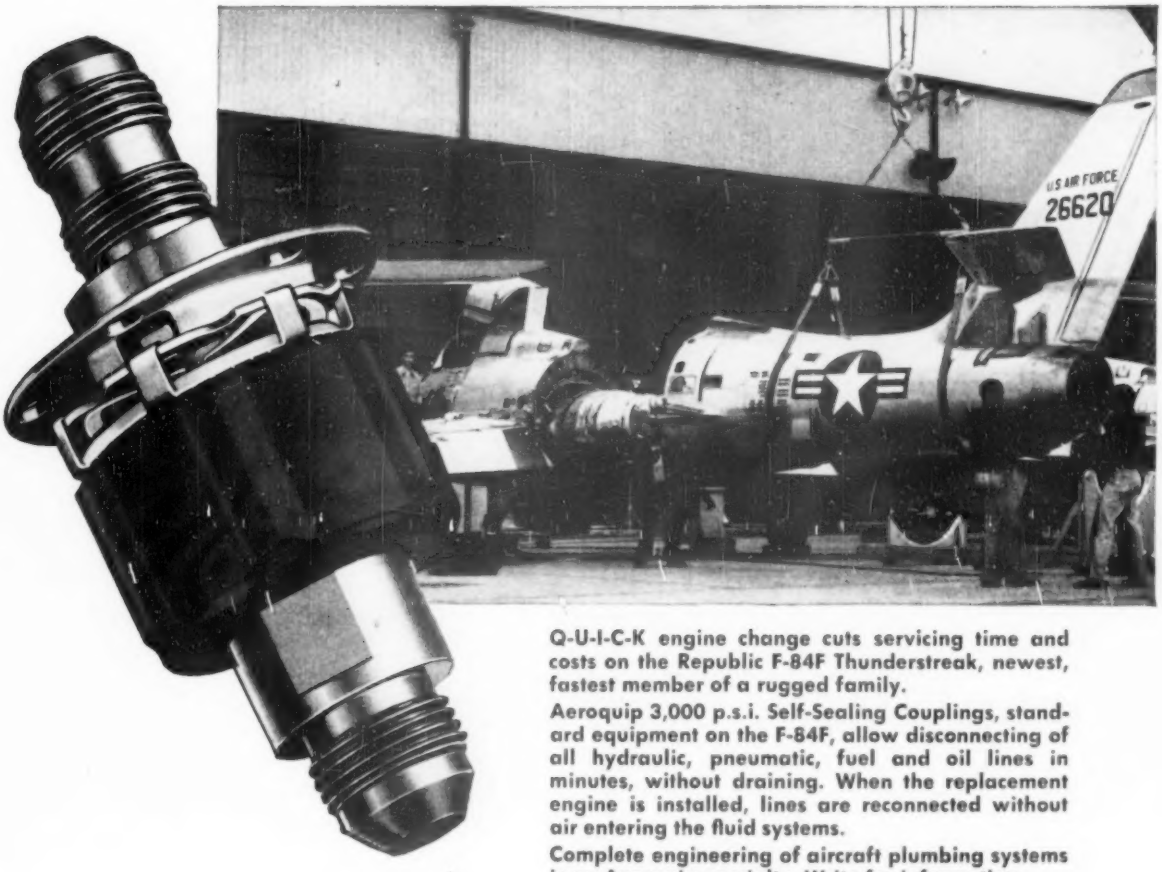
▶**Modified Muffler**—The muffler is made from several sections of a silencer normally used with jet engine test stand installations. Designed by Jack Cullum, managing director of Detuners, Ltd., London, the muffler is about 45 ft. long, compared with the 80-90-ft. length of a testbed silencer.

The open pen is 12 ft. 6 in. high and completely encloses the plane. Wall interiors are lined with sound-absorbing material, as are the insides of the two steel sliding doors. Shelters built into the walls protect maintenance personnel from the weather.

An additional benefit of the pen is that air for the jet engine is taken in from the atmosphere above the enclosure, avoiding contaminating the powerplant with stones and dirt which might otherwise be drawn in.

On the New Republic F-84F, Aeroquip Self-Sealing Couplings

SPEED ENGINE CHANGE



Q-U-I-C-K engine change cuts servicing time and costs on the Republic F-84F Thunderstreak, newest, fastest member of a rugged family.

Aeroquip 3,000 p.s.i. Self-Sealing Couplings, standard equipment on the F-84F, allow disconnecting of all hydraulic, pneumatic, fuel and oil lines in minutes, without draining. When the replacement engine is installed, lines are reconnected without air entering the fluid systems.

Complete engineering of aircraft plumbing systems is an Aeroquip specialty. Write for information.

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for -LOW temp.
Withstands 2000° F. fire emergencies—silicone sponge rubber core with silicone rubber impregnated Fiberglass covering.
for -LOW temp.
—500° to —125° F.—solid silicone rubber core with silicone rubber impregnated Fiberglass covering.
for -LOW temp.
+500° to —125° F.—hollow core tube made of multiple plys of silicone rubber impregnated Fiberglass.
for -LOW temp.
Fiberglass matt core covered with Teflon Fiberglass or Neoprene impregnated Fiberglass.
for -LOW temp.
Silicone sponge rubber core covered with Teflon Fiberglass or Neoprene impregnated Fiberglass.
for -LOW temp.
Solid silicone rubber core with Teflon Fiberglass or Neoprene impregnated Fiberglass covering.
for -LOW temp.
Hollow core—resilient, flexible tube made up of multiple plys of Neoprene impregnated Fiberglass.
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Excellent abrasion resistance. Fiberglass matt core with covering of impregnated Nylon, Orlon or Dacron.
for LOW temp.
Extra resiliency and abrasion resistance—sponged silicone rubber core with impregnated Nylon, Orlon, Dacron cover.
for LOW temp.
Moderate resilience, good abrasion resistance—solid silicone rubber core with impregnated Nylon, Orlon or Dacron covering.
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Hollow tube core, either extruded silicone rubber or multiple plys of fabric. Covering of impregnated Nylon, Orlon or Dacron.

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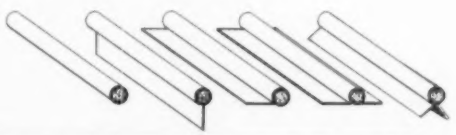
Arrowhead, originators of Fiberglass covered sponged silicone seals, offers a complete line of resilient compression seals for engine firewalls, bulkhead, compartment and hatch sealing and other aircraft uses. Fyre-tite seals withstand a 2000° F.—15 minute fireproof test, and operating temperatures from —125° to +500° F. Frigi-Flex seals combine resiliency and flexibility at moderately high to extremely low temperatures with exceptional toughness and abrasion resistance. Both Fyre-tite and Frigi-Flex seals are light weight, resistant to heavily concentrated ozone and to engine fluids.

Twenty-seven basic material combinations in five standard shapes meet most aircraft requirements; custom made shapes and materials for special purposes.

Write for engineering data and information.



ARROWHEAD RUBBER COMPANY

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PRODUCTION BRIEFING

▶ **Airlift of high priority materials** to speed eight-jet B-52 bomber production is being undertaken by Boeing-Seattle in supplying second-source Wichita plant with close-schedule items such as master tools, production parts or engineering material where delivery delays would prove critical. C-97 Stratofreighters are used.

▶ **One-millionth Mighty Mouse rocket** has been delivered to armed forces by Hycon Manufacturing Co., 2961 E. Colorado St., Pasadena 8, Calif. Mighty Mouse is 2.75-in. folding fin aircraft rocket.

▶ **New engine muffler facilities,** for quieting jet runups at Canadair's Montreal plant, have reduced sound volumes reaching nearby communities by approximately 15-30 decibels.

▶ **Lear, Inc.,** is continuing expansion at Santa Monica, Calif., Airport with two more buildings, providing a total of 69,000 sq. ft. floor space under construction. A 20,000-sq. ft. structure will house heat treating, plating and other new equipment. A new 49,000-sq. ft. hangar and office building nearing completion will augment Lear's aircraft engineering division facilities for producing Learstar business planes.

USAF Contracts

Following is a list of recent USAF contracts announced by AMC:

Beech Aircraft Corp., Wichita, prototypes of MD-3, mock-up of MD-3 gen. set, $1,106,540.

Century Industries Corp., San Pedro, Calif., launcher, rocket, airborne, 200 ea., 99.809 ea., $3,678,345.

Chance Vought Aircraft, Dallas, starter generators, 206 ea., $82,400.

Collins Radio Co., Cedar Rapids, receiver, transmitter, 125 ea., $422,315.

Continental Aviation and Engr. Corp., Detroit, YJ69-T-17 engines, 15 ea., $349,320; engine parts, engine overhauls, 25 ea., $281,861; spec. tools and ground handling equipment for R975 engines, $40,000.

Continental Motors Corp., Muskegon, Mich., U-470-2 engines, 55 ea., $392,431.

Convair, Ft. Worth, facilities for prod. of B-58 aircraft, $2,211,000; facilities for prod. B-52 aircraft assys., $40,000.

Delevan Mfg. Co., W. Des Moines, Iowa, facilities for prod. of J57 fuel nozzles, $100,000.

General Electric Co., W. Lynn, Mass., indicator, tachometer, electric, type E-30 & 31, 1,558 ea., 1,905 ea., $245,169.

Goodyear Tire and Rubber Co., Akron, wheel assys., brakes, spare parts, $120,891.

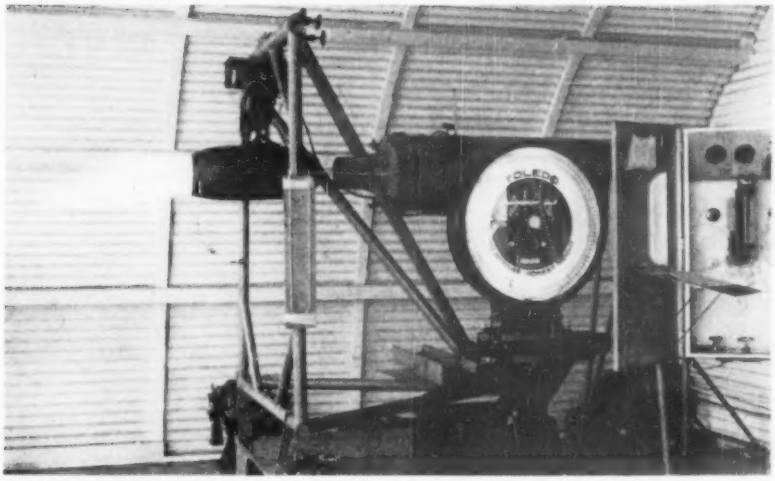
Magnavox Co., Ft. Wayne, Ind. control assys., bomb arming, double bracket, 16,116 ea., $58,823.

Glenn L. Martin Co., Baltimore, B-61A pilotless aircraft, 57 ea., $5,134,511.

Phillips Petroleum Co., McGregor, Tex., facilities, $5,649,120.

Raytheon Mfg. Co., Waltham, Mass., electron tubes, 369 ea., 178 ea., $2,066,467.

Robertson Photo-Mechanix, Inc., Chicago, darkroom copying camera, 5 ea., $38,725.



STATIC TEST RIG is hooked up to Toledo scale to measure thrust. Pointer shows 58 lb.

How Hiller Tests Tiny Ramjet

An extensive development and test program lasting five years was necessary before Hiller Helicopters, Inc.'s little 8RJ2B rotortip ramjet met company and CAA specs.

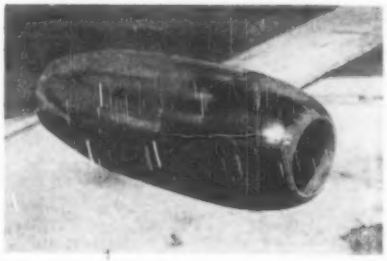
The engine has passed a 150-hr. trial on the test-stand with no limitations noted on its CAA type certificate—first of its kind to be granted.

The 8RJ2B is a complete unit consisting of a diffuser, flameholder, combustion chamber and exit nozzle. Body is made up of shell segments formed from thin sheet, welded to a heavier mounting plate forming the engine's inboard center section.

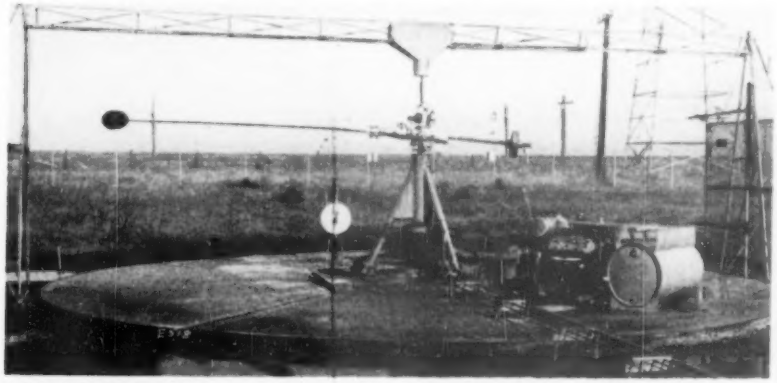
This plate tapers in section and provides a thick central boss to which the rotor blade attachment tab is welded. Inlet is faired by an inner liner forming a diffuser and the exit reinforced by a thick collar welded to the shell segments. A radial, rearward-sloping finger-type flameholder is located centrally in the aft section of the diffuser.

Pertinent data: Length 21.3 in.; max. diameter 8.4 in.; weight 12.7 lb.; 45-hp.

HORNET COPTER tests ramjets aloft.



RAMJET is mounted on Hornet rotortip.



WHIRL TEST RIG has been used for well over 2,000 hr. of trials, simulating flight.

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MODEL 46129

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Ranges from 0-100 psi. to 0-6500 psi., (abs., diff., gage). Instruments are available for operation under either normal or extreme conditions of vibration and acceleration or for corrosive media.

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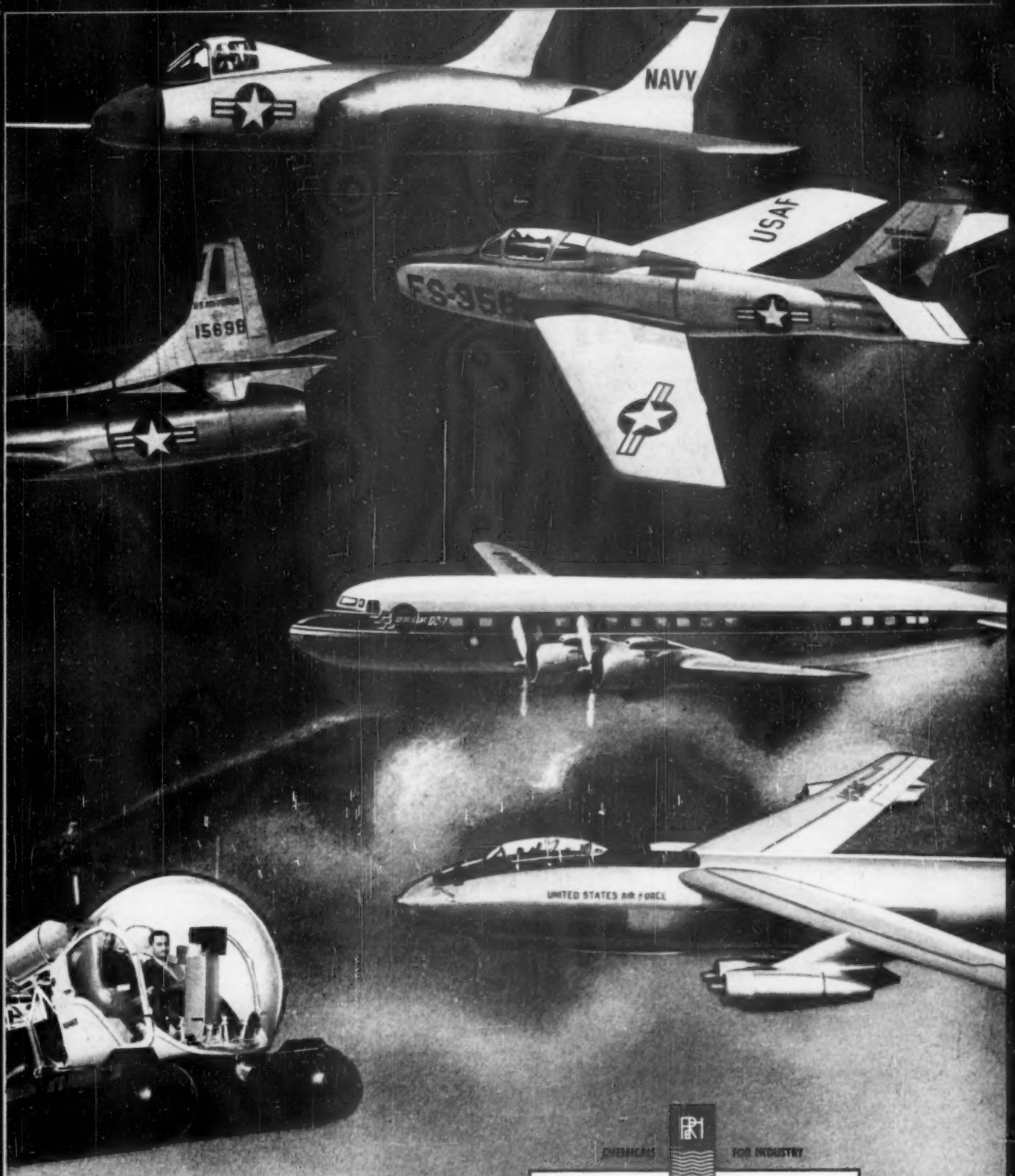

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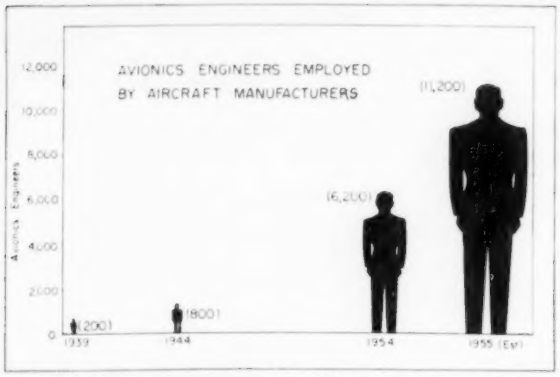

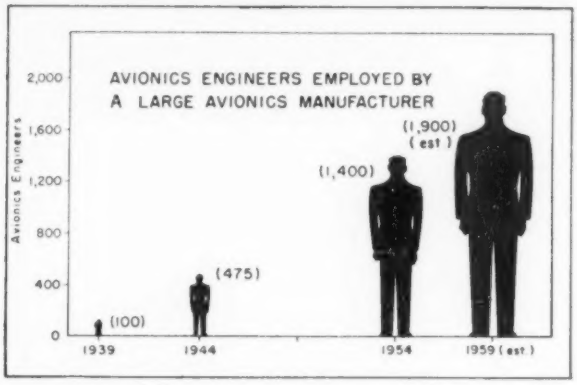

PHENOMENAL GROWTH OF AVIONICS SEGMENT of airframe industry (graph at left) overshadows the corresponding growth of the avionics industry itself, as typified by number of engineers employed by one large avionics manufacturer (right).

Aviation Week Survey Shows:

Airframe Avionics Is Fast-Growing Giant

By Philip Klass

In 1939, electrical-electronic engineers in aircraft plants were so rare as to be almost an oddity. Today, U.S. airframe manufacturers alone employ more than 6,200 avionics engineers and the figure may top 11,000 by 1959, an AVIATION WEEK survey indicates.

In 15 years there has been a 3,100% increase in the number of avionics engineers on airframe industry payrolls, the survey shows. Today, almost one out of every five engineers in an aircraft plant is engaged in avionics activities. These figures do not include an estimated 1,500-2,000 avionics engineers employed at Hughes Aircraft Co., which now considers itself an avionic rather than airframe manufacturer.

This overshadows even the growth of the avionics industry during the past 15 years, which itself has been phenomenal. For instance, one major avionics manufacturer had a 1,400% increase in avionic engineering staff during the same period. During the next five years, this manufacturer anticipates a 35% increase in avionics staff, compared to an 80% increase expected within the airframe industry.

The AVIATION WEEK survey also shows a sizable amount of avionic research and development within airframe companies, something of competitive significance to all established avionics manufacturers.

► **Why the Growth?**—This phenomenal growth reflects the greatly expanded role of avionic equipment in modern aircraft, and the even larger role in the fast-rising missile field. Fifteen years ago only a handful of avionics engineers were needed to lay out the simple electrical generation system and plan the installation of the radio direction finder and communications equipment, just about all the avionics equipment carried on board.

Today, however, bombers, interceptors, and fighters are jammed with avionic equipment—radar fire control, electronic countermeasures, navigation computers and receivers, automatic pilots and stability augmenters, in addition to communications equipment. Most of this equipment must be carefully engineered into and integrated with the airframe for optimum performance.

Guided missiles impose even more rigorous demands for integration of airframe, powerplant, and avionics, which is reflected in the higher percentage of airframe industry avionics engineers who devote their efforts to missiles.

AVIATION WEEK's survey shows that 55% of the aircraft industry's avionics engineers are working on missiles, 43% on piloted aircraft, the remainder on miscellaneous duties.

► **"Creeping Avionics-ism"**—Avionics manufacturers have been aware for some time of what at least one of them calls "creeping avionics-ism" in certain segments of the airframe industry. AVIATION WEEK's survey reveals quantitatively for the first time the extent of airframe industry inroads.

One significant measure of this potential threat to the established avionics industry is the number of airframe engineers engaged in avionic research and development within their own labs, as compared to those engaged in installation engineering or supervising developments by outside vendors. These R&D activities will spawn the new ideas, devices, and systems which may compete with the established avionics industry. In some instances, this competition already exists.

► **R&D Activities**—The AVIATION WEEK survey shows that the following percentages of airframe industry avionics engineers are engaged in R&D activities:

- 33% combined average for all avionics engineers.
- 45% of those engaged in guided missiles work.
- 20% of those engaged in piloted aircraft work.

► **Piloted-Aircraft Avionics**—An indus-

Exclusive Report

For several years the avionics industry has watched with some apprehension the growing staffs of avionics engineers employed by airframe manufacturers and the increased activity of airframe companies in this field. Now, for the first time, Aviation Week is able to detail the growth and scope of this development, as shown by analysis of an industry study conducted by this magazine.

Succeeding articles in this series will discuss factors which appear to favor increasing inroads by the airframe industry, as well as restraining factors which may tend to limit such penetration, based on conversations which Aviation Week's Avionics Editor, Philip Klass has held with both airframe and avionics manufacturers.

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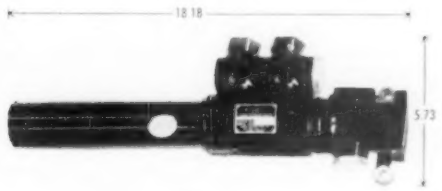

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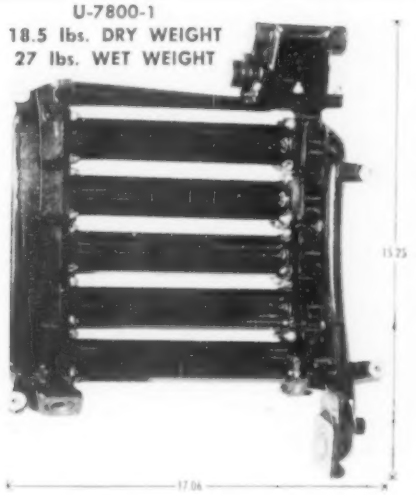

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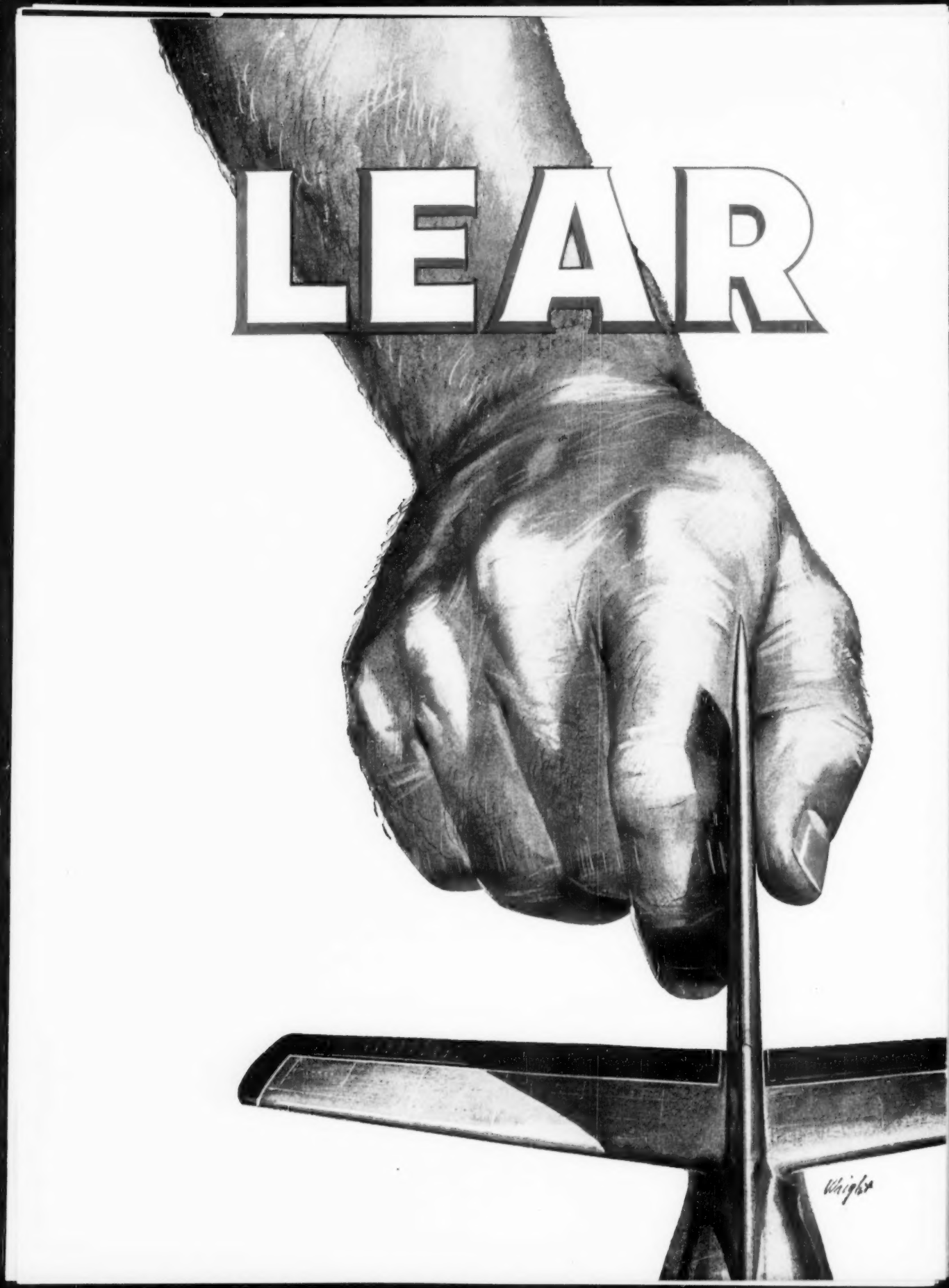
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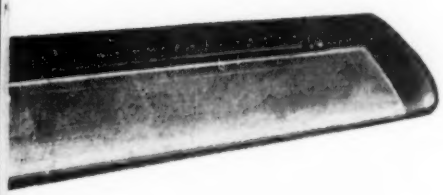
IS IT INDUSTRY APPROVED? The Arcon will soon be offered as *factory* installed equipment by most leading aircraft manufacturers.

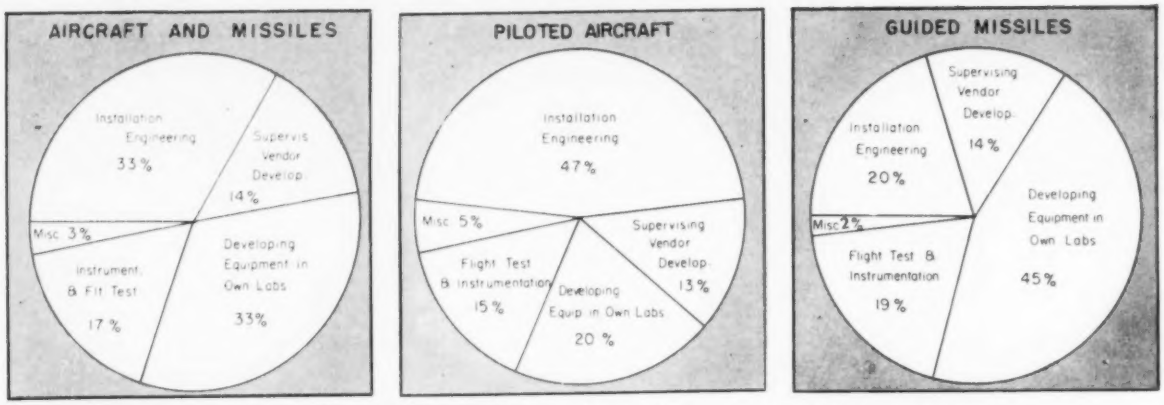
IS IT PILOT APPROVED? Ask any pilot who has had an opportunity to fly it. You will soon find very few pilots who will fly without it, because it makes an airplane fly the way it should fly—automatically. The Arcon is here *now*. See it. Fly it. Discover how it "marks a new era of safety and utility" for *you!*

See your nearest Lear distributor or write for full information to Lear Inc., LearCal Division 3171 S. Bundy Drive, Santa Monica, California.



***ARCON** means **A**utomatic **R**udder **CON**trol*

LC-16



PIE CHARTS SHOW how airframe industry (aircraft and missiles) makes use of its many electrical-electronic engineers.

try-wide breakdown of avionics engineers' activities for those engaged in piloted-aircraft operations indicates that more are performing in-house R&D than are supervising developments purchased from the outside avionics industry. However, the lion's share goes into installation engineering. The breakdown for piloted aircraft:

- 20% developing equipment in own labs.
- 13% supervising outside vendor developments.
- 47% in installation engineering.
- 15% in flight test and instrumentation.
- 5% miscellaneous.

Because some companies consider the size of their engineering staff proprietary information, AVIATION WEEK volunteered not to release breakdowns for individual companies. However, the survey indicates that the following devote a substantial percentage of their total piloted-aircraft avionics activities to in-house R&D: Convair-San Diego, Northrop, Ryan, Bell, and Republic. Companies at the other extreme include McDonnell and Temco.

▶ **Breakdown for Missiles**—A corresponding industry-wide breakdown for avionics engineers in missiles work shows some significant differences. For instance, a much higher percentage of total effort is devoted to in-house development, much less to installation engineering. Here are the survey results, with corresponding aircraft figures shown in parentheses for ease of comparison:

- 45% developing equipment in own labs (20%).
- 14% supervising outside vendor developments (13%).
- 20% in installation engineering (47%).
- 19% in flight test and instrumentation (15%).
- 2% miscellaneous (5%).

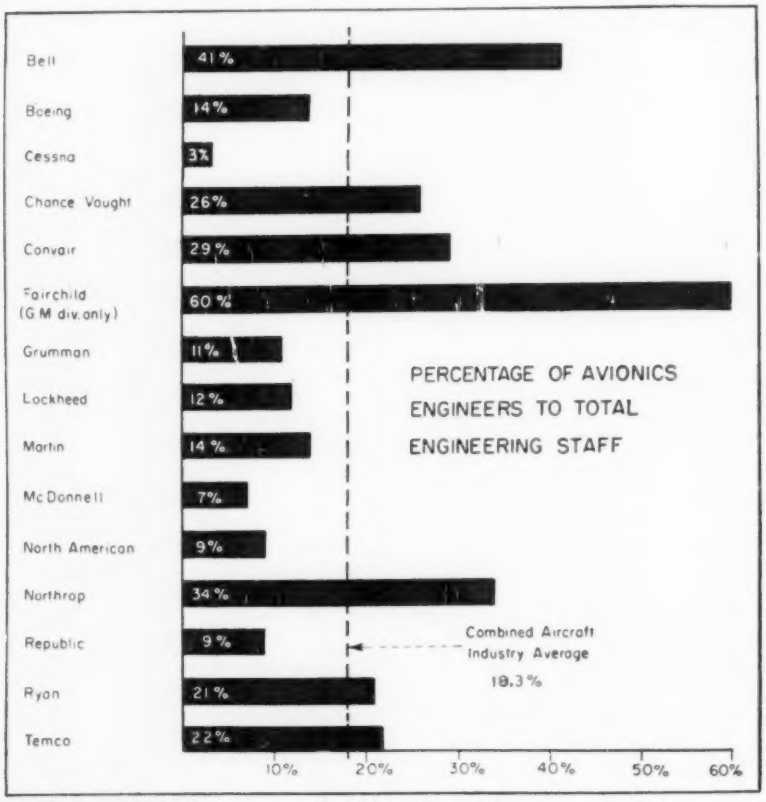
Companies which devote a higher than average amount of avionics staff activities to missile in-house development include Convair-San Diego, Fairchild's Guided Missiles Division, and Temco, the survey indicates. Chance Vought, Convair-Ft. Worth, and Ryan are below average on this score.

The lower percentage of effort for installation engineering reflects the fact that most avionic equipment is tailored to its specific missile during its development and that there are few, if any, standardized equipments furnished by the government as GFE (government furnished equipment).

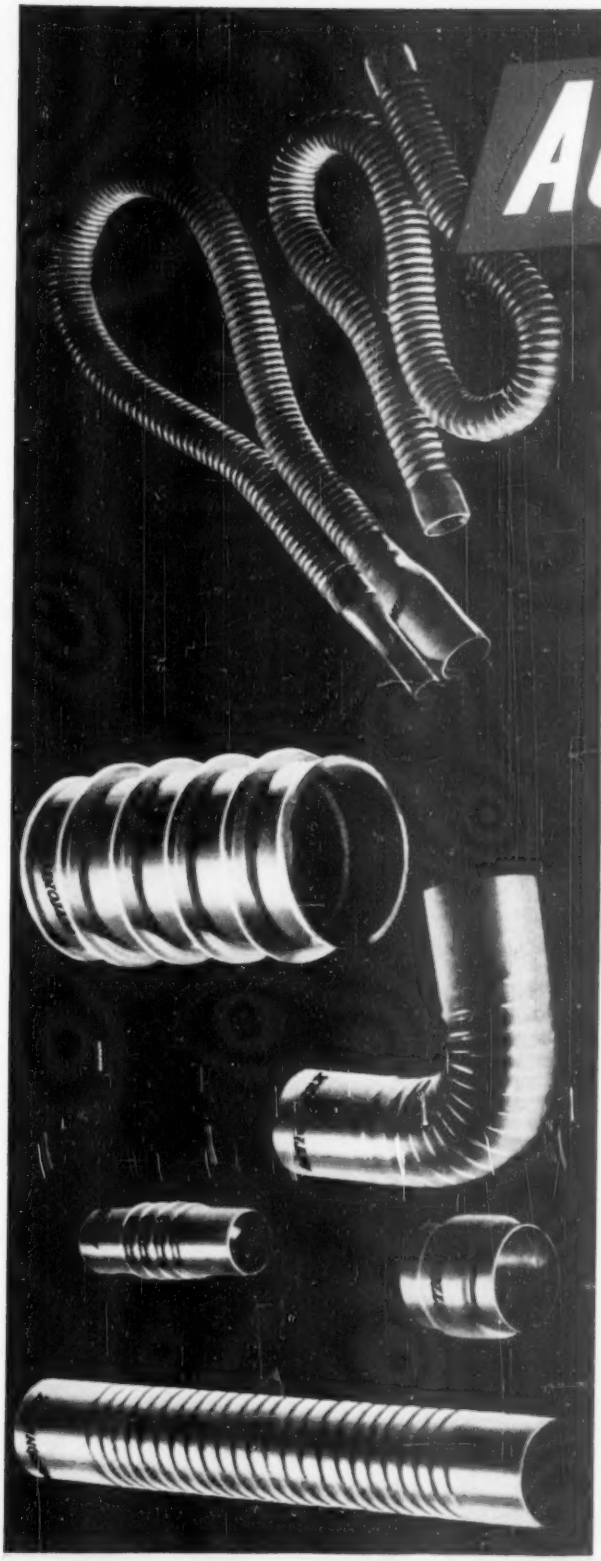
The higher percentage of in-house R&D reflects the thinking of some missile makers that this approach permits better integration of avionics and missile, when the latter's performance and configuration are subject to frequent changes. (There are convincing arguments on both sides of this issue.)

However, as production emphasis swings from aircraft to missiles (with their higher avionic content), regular avionics manufacturers seeking to maintain their share of the available market justifiably can be concerned over this high percentage of in-house avionic development in airframe plants.

▶ **Combined Breakdown**—A combined airframe industry breakdown of avionics engineers activities for both air-



NEARLY 1 OUT OF 5 engineers employed by airframe industry is in avionics.



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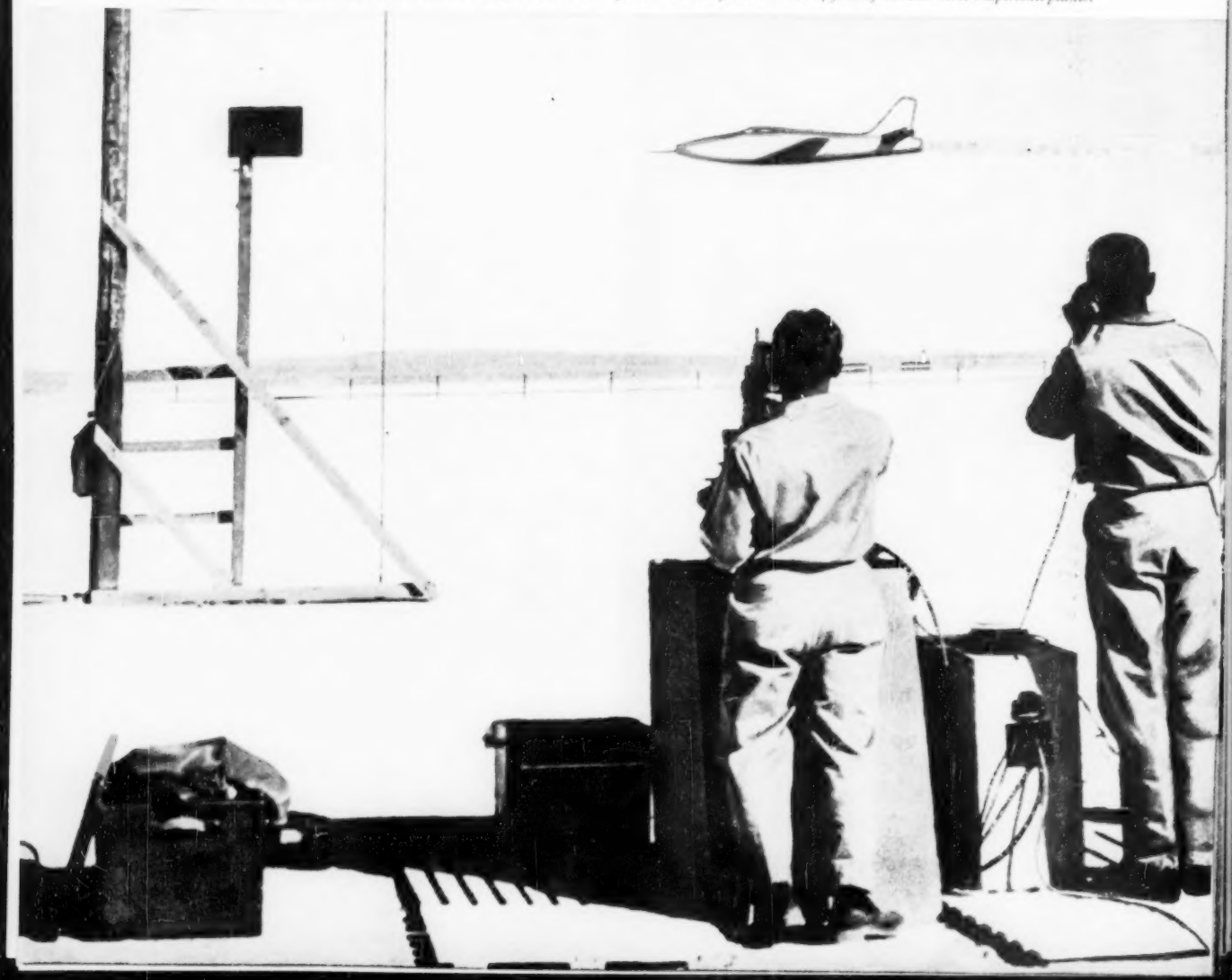
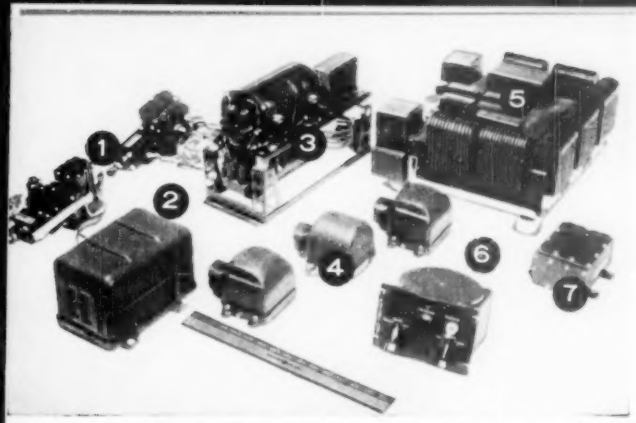
AUTOMATIC FLIGHT AT MACH 1 – AND BEYOND

Supersonic speeds are accurately recorded at instrument stations like this at Muroc, California, Air Force testing ground. Honeywell's new E-10 autopilot—in design four years ago, before supersonic craft had been developed—has already been chosen to fly one of the Air Force's supersonic planes.





Components of the new E-10 Autopilot (1) hydraulic servo motors; (2) cageable vertical gyro; (3) altitude and mach sensor; (4) rate gyros; (5) amplifier and calibrator; (6) pilot's control panel; (7) automatic trim control. The 15-inch rule you see above indicates component size.

Exhaustive flight tests of the E-10 were made on test aircraft both at Honeywell's Minneapolis flight test center and the company's winter flight test headquarters. Climbing into the ship here is Honeywell assistant manager of flight operation, R. J. Whemper.

New Honeywell E-10 *Autopilot provides automatic flight from take-off to transonic speeds*

AT MACH 1 (the speed of sound) and beyond an aircraft needs additional stabilization. Its speed is so tremendous that all a pilot's skill is required to fly and navigate his aircraft—to say nothing of performing complex maneuvers.

That's why an autopilot is vital—to relieve the pilot of much of his flight duty so that he can perform his assigned mission. That's also why a truly advanced autopilot like the new Honeywell E-10 is required—one designed specifically for mach 1 flight.

But, you don't always fly that fast. The E-10 takes this into consideration, too.

New E-10 *is self-adjusting*

In order to take off at around 100-mph the elevators and rudders must have considerable travel to get a heavily loaded aircraft into the air. As you approach the sonic barrier only slight deflections of the control surfaces are required to perform normal maneuvers. Beyond mach 1 you again need more control movement to perform your maneuvers. The E-10 automatically compensates and adjusts itself through all speed ranges.

The E-10 Autopilot is a new concept in high-performance flight control systems in that it is designed to "match the mission" of the airplane. Here it departs from the familiar notion of an autopilot's function—that of holding the aircraft straight and level, or making simple turns.

What the new E-10 *does*

The E-10 (1) stabilizes the airplane at all speeds, (2) maintains constant speed even in diving or climbing maneuvers. With associated radar and navigation systems the E-10 (3) steers the airplane on an automatic interception course, (4) guides the plane along a curved path in pursuit of an unseen enemy, (5) performs let-down approaches automatically in any weather.

With the E-10, automatic flight control is limited only by the maneuvering capabilities of the airplane. Yet, throughout any automatic maneuver, the human pilot retains full command through a special feature called Control Stick Steering.

This means that even though the plane is flying on autopilot the human pilot can instantly override or simply adjust the autopilot through his conventional cockpit controls.

Controls for everything that flies

We believe our contribution to America's position in the air rests on two special abilities: The ability to *design* the increasingly complex control systems which today's aircraft require. And the ability to produce these systems in quantity—on a basis of interchangeability of components which saves money for airframe and engine manufacturers, the armed services, and American taxpayers.

Besides the new E-10 Autopilot, Honeywell produces a complete line of gyros for stabilization, fire control, aircraft control, and missile guidance . . . other electronic autopilots for helicopters and fixed-wing craft . . . transistor fuel gages . . . jet engine controls . . . power controls . . . synchronous vibrators . . . actuators . . . amplifiers . . . valves and switches.

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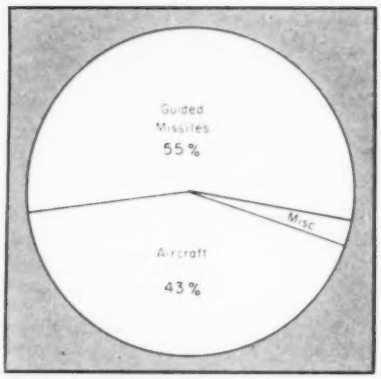


GUIDED MISSILES claim 55% of aircraft industry's avionics engineers.

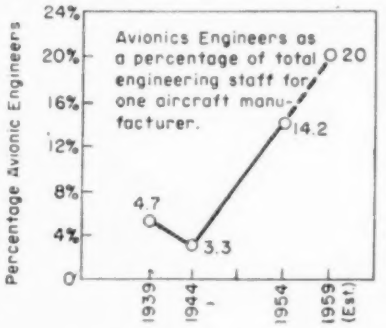
craft and missiles looks like this:

- 33% developing equipment in own labs.
- 14% supervising outside vendor developments.
- 33% in installation engineering.
- 17% in instrumentation and flight test.
- 3% miscellaneous.

▶ **One out of Five**—Nearly one out of every five engineers on airframe manufacturers' payrolls, 18.3% to be exact, is in avionics, AVIATION WEEK's survey shows. In companies like Convair, Northrop, Bell, and in Fairchild's Guided Missiles Division, this ratio runs 30, 40, and up to 60%, as shown in the bar graph on page 48.

The graph indicates which airframe companies are most heavily committed to avionics, although percentages can be somewhat misleading and exact figures cannot be cited for competitive reasons. For instance, North American Aviation and Martin each have more than 500 avionics engineers, but their total engineering staff is so large as to dwarf the avionics staff into comparatively small percentage figures.

▶ **Extrapolating the Returns**—In a few instances, survey returns had to be extrapolated to obtain overall industry results. For instance, Douglas Aircraft Co. declined to give any information on the number of avionics engineers it employs. The reason, according to a company spokesman, is that "our organization has not yet made a distinc-



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Stratos cabin superchargers have approved operating periods of up to 2000 hours. With the world's leading airlines they have chalked up outstanding service records — over 93% reach their approved operating time even in the summer months.

Stratos bootstrap air cycle refrigeration units, in actual service tests, have operated 3000 hours without any servicing other than periodic lubrication checks.

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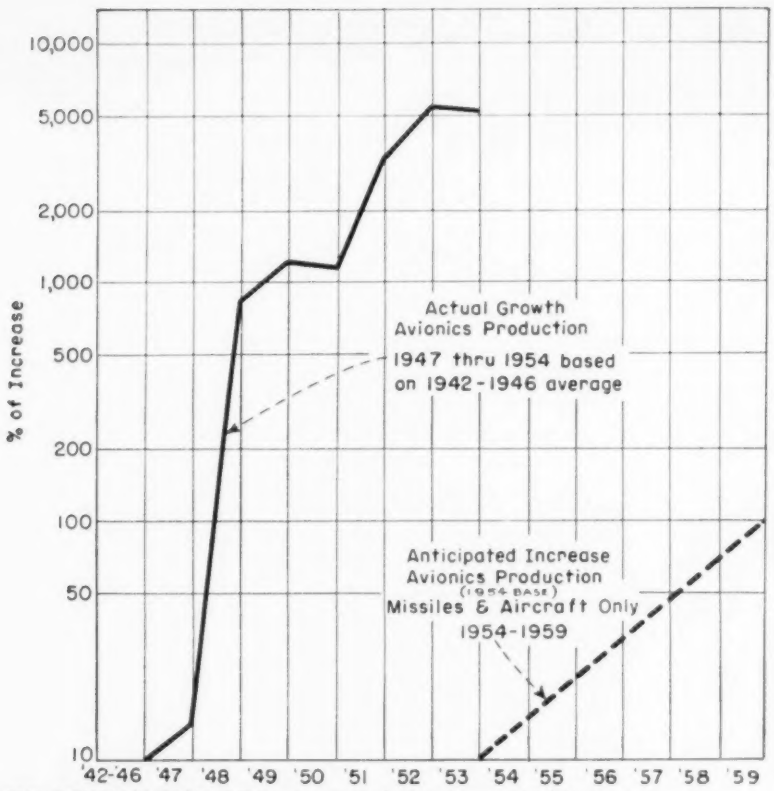


ONE AIRFRAME COMPANY'S avionics production jumped 50-fold in eight years.

tion between electronics and other types of engineering. For example, we have large electrical departments in all of our plants but they are as apt to be or perhaps more apt to be at work on powerplants than on radio, radar, computers, or other types of electronic equipment."

Rather than ignore Douglas in the industry-wide totals, AVIATION WEEK assumed that the ratio of its avionics staff to total engineering staff (which the company did provide) was at least one-half the average for the rest of the industry, or roughly 9%. On this basis, a figure of 300 avionics engineers was used for Douglas.

Two companies declined to estimate the 1959 size of their avionics staff. AVIATION WEEK therefore computed the estimated growth ratio (1954/1959) for all other companies, then applied this ratio to the present staff size to give an extrapolated 1959 figure for these two companies.

Recognizing that the distinction between graduate engineers and those doing equivalent work, but without sheepskins, is not too firmly drawn today, particularly in the aircraft industry, AVIATION WEEK's survey questions referred to "electrical and electronic engineers (including physicists engaged in electrical work)" and did not specify "graduate engineers."

▶Silent on Production—The survey asked airframe manufacturers to indicate the approximate dollar volume of avionic equipment which they were currently manufacturing in pilot or production quantities and to estimate a figure for 1959. All but one company declined to provide such figures, many citing competitive or military security.

One firm, a relative newcomer in avionics, said it would produce $1.3 million worth of avionics this year, and estimated the figure would jump to $55 million by 1959.

Another airframe company, declining to give dollar figures, did provide curves (see above) which showed that its avionic production has increased 5,000% in eight years, using the 1942-46 period as a benchmark. (The company produced a modest amount of avionics during this base period.) The company estimates that its avionic output will double in the next five years.

▶The Future?—So far, the airframe industry's avionics activities have been largely R&D, pilot production, and in support of aircraft and missile production. Except at Hughes Aircraft Co., there has been comparatively little large-scale avionic manufacturing.

However, if present pilot production expands, and avionics staffs grow as fast as predicted, the established avionics industry could face much more serious competition five years hence. In following issues, AVIATION WEEK will consider the prospects of this happening as well as some of the countervailing factors which will act as a brake on such a movement, including steps which some avionics manufacturers are now considering or taking.

Navy Ordnance Gets Highspeed Computer

A new super-speed electronic computer, with capabilities which make it attractive for solving complex aircraft, missile, and engine design problems, has been developed by International Business Machines Corp. for Navy's Bureau of Ordnance.

The new machine, called NORC (Naval Ordnance Research Calculator), will soon be installed in the Naval Proving Grounds Computation Laboratory, Dahlgren, Va.

The new computer can add or subtract two 13-digit numbers in 15 microseconds, multiply two such numbers in 31 microseconds, IBM says. The machine operates with either automatic floating or specified decimal point.

▶Technical Details—NORC uses a 16-digit size word, decimal number system, and a three-address instruction. Automatic address modification permits the same set of instructions to perform successive sets of arithmetic operations on a series of numbers.

A highspeed electrostatic memory can store up to 2,000 words, with an access time of eight microseconds, IBM says. Up to eight magnetic tape units provide a larger, slower memory storage with a read-out rate of 70,000 characters per second. This is more than five times faster than previous tape memory units.

Computer output is recorded on two highspeed printers which operate at 18,000 characters per minute. Computer calculating speed is reduced only 3% while printers are in operation, company reports. Basic computer pulse rate is 1 megacycle.

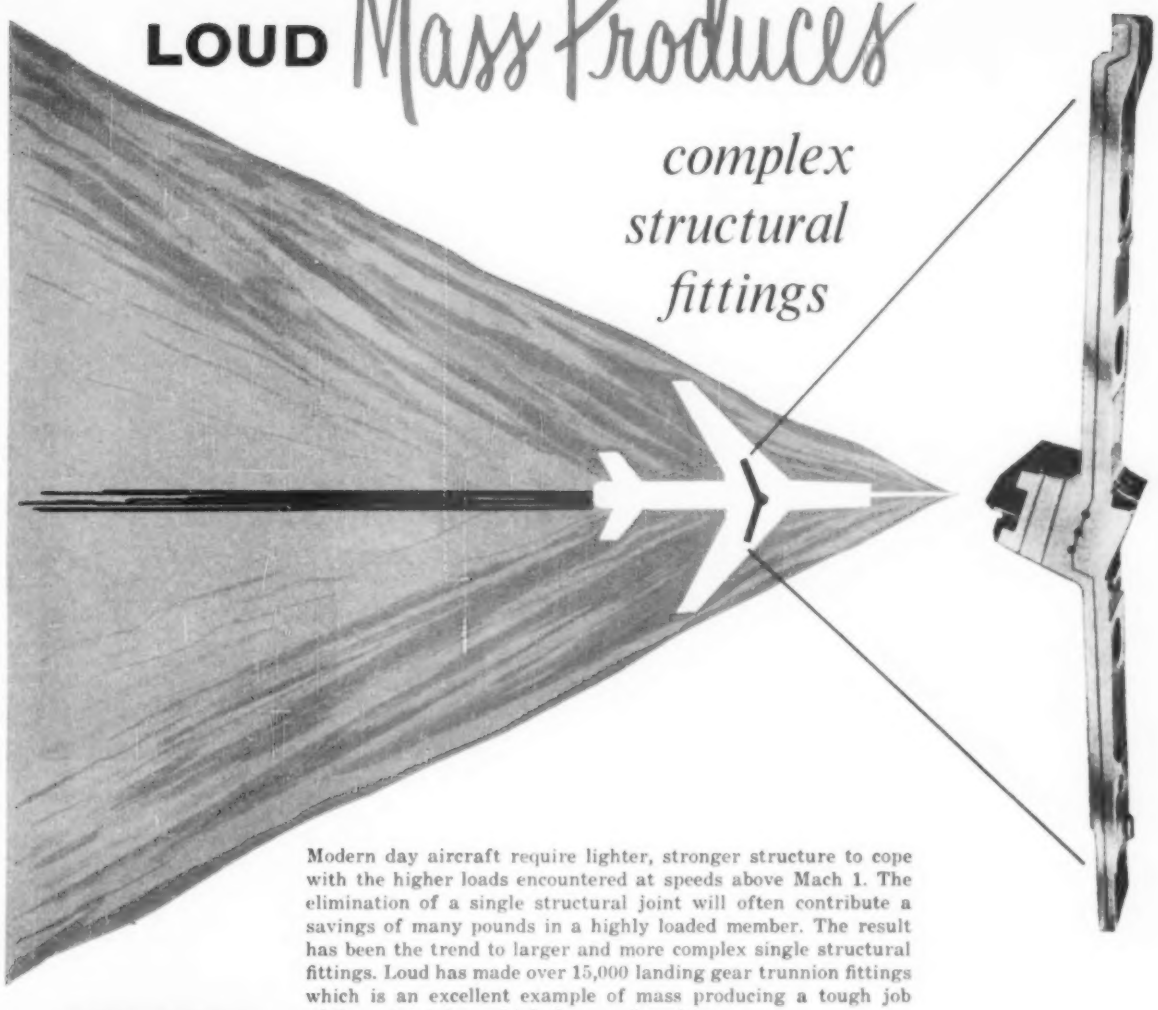
New Microwave Test Equipment

An X-band radar test set, suitable for lab, production line, or field use, is one of several recently announced pieces of microwave test equipment.

The new radar tester can be used to measure power output, transmitter spectra distribution, frequency, and to supply artificial signals. Bandwidth characteristics can be analyzed and a self-contained square-wave generator aids in making VSWR measurements. Unit operates from 50 to 1,200 cps. power, weighs 45 lb. Manufacturer is

LOUD *Mass Produces*

complex structural fittings

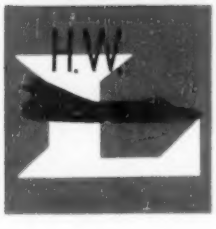


Modern day aircraft require lighter, stronger structure to cope with the higher loads encountered at speeds above Mach 1. The elimination of a single structural joint will often contribute a savings of many pounds in a highly loaded member. The result has been the trend to larger and more complex single structural fittings. Loud has made over 15,000 landing gear trunnion fittings which is an excellent example of mass producing a tough job while maintaining a high degree of quality.

CASE HISTORIES

Today's airplane is being built out of large forgings rather than fabricated sections. The spar fitting which combines landing gear trunnion support and wing spar into one single forged and machined fitting is representative of planes of tomorrow. Although this fitting is over 8 feet long it is machined on Loud's 120 inch Cincinnati hydrotels. Advance in designs create more complicated machined operations.

The maximum utilization of facilities is illustrated in the flash welding of a stabilizer beam. The change from the previous bolted joint design saved over 16 pounds per airplane in addition to saving considerable cost and providing a stronger fitting.



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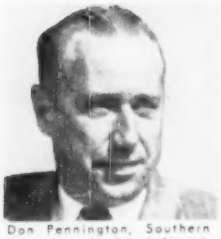
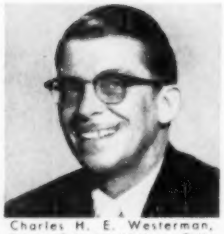


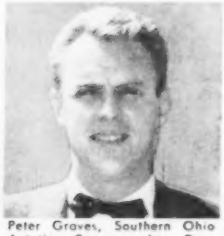
Don Pennington, Southern Aero, Inc., Municipal Airport, Atlanta, Georgia.

H. Leibee Wheeler, Buffalo Aeronautical Corporation, Buffalo Municipal Airport, Buffalo, New York.

Gene Hudman, Carolina Division of Southern Aero, Inc., Charlotte, North Carolina



Charles H. E. Westerman, British Colonial Airlines, Calle Lopez No. 1 — Despacho 502 Mexico, (1) D.F., Mexico.



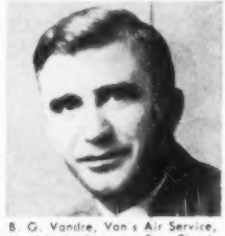
Peter Graves, Southern Ohio Aviation Company, Inc., Dayton Municipal Airport, Vandalia, Ohio.

Art Meuter, Arthur Meuter Co., Inc., LaGuardia Field, New York, N. Y.

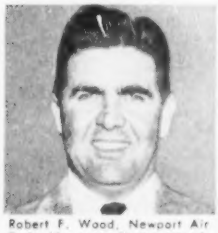
H. Warren Halladay, Stonnell and Halladay, Easton Municipal Airport, Easton, Md.

Don Hood, Air Sales & Service, Inc., Weir Cook Municipal Airport, Indianapolis, Indiana.

O. B. Calan, National Aero Sales Corp., Midway Airport, Chicago, Ill.



B. G. Vandre, Van's Air Service, Municipal Airport, St. Cloud, Minnesota



Robert F. Wood, Newport Air Park, Newport, Rhode Island.

Louis Humphreville, Executive Aircraft Corp., Detroit City Airport, Detroit 13, Michigan

Don Vest, Vest Aircraft & Finance Co., P. O. Box 5306, Sky Ranch Airport, Denver, Colorado.

A. M. "Sime" Bertolet, Reading Aviation Service, Inc., Municipal Airport, Reading, Pennsylvania.

Max Brand, Downtown Airpark, Inc., 1800 South Western, Oklahoma City, Oklahoma.

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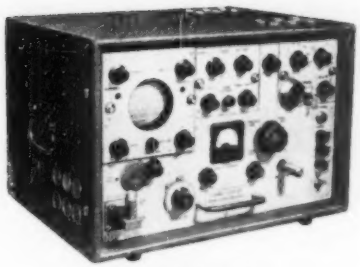

X-BAND TEST SET

Kearfott Co., Inc., Western Manuf. Div., 14844 Oxnard St., Van Nuys, Calif.

Other new microwave test equipment includes:

• **Pulse generator,** Model PG-215, a mercury-relay plus pulse-forming-line type, can produce pulses with rise and decay times down to 1.2 milli-microseconds at repetition rates of 60 or 120/sec. Amplitude of output pulse is variable from 0 to 35 volts with a 93-ohm load. Unit also furnishes an isolated trigger signal. Manufacturer is Teletronics Laboratory, Inc., Westbury, N. Y.

• **C-band wavemeter,** Model 230, covers frequency range of 3.5 to 6.5 kmc. by either transmission or absorption method. Unit can handle 0.5 milliwatt to 1 watt by absorption method; 1 mw. to 25 watts by transmission method. Approximate loaded Q is 2,500. Manufacturer: Amerac, Inc., 116 Topsfield Road, Wenham, Mass.

• **Preset-interval generator,** Model 564, can be used to generate or measure time intervals and delays of 1 microsecond to 1 second. Desired intervals are selected by means of six 10-position switches. A built-in 1-mc. crystal-controlled oscillator is used to measure time intervals. Manufacturer: Potter Instrument Co., Inc., 115 Cutter Mill Road, Great Neck, N. Y.

FILTER CENTER

▶ **New Look for B-58 Avionics**—Because of critical problem of dissipating heat from avionic equipment in Convair's highspeed B-58, all avionic equipment reportedly is being packaged to permit cool air exhausted from the cabin to be circulated through the cases before being exhausted to the atmosphere.

▶ **Servo Corp. to Build Rafax**—New Rafax, which enables air traffic control radar scope presentation and air-ground voice to be simultaneously recorded on magnetic tape for future playback and analysis, will be manufactured and sold by Servo Corp. of America under trade name of Servofax. Company recently signed licensing agreement with Haller, Raymond and Brown, Inc., which developed the radar recording system.

▶ **Air France VHF in Mexico**—Air France has installed a VHF transmitter atop Real Del Monte whose 8,000-foot altitude gives the station a 300-nautical mile range, covering the area between the Gulf of Mexico and Mexico City over mountainous terrain. The mountain-top station is tied into Mexico City by microwave link.

▶ **Auto-Assembly Progress Reported**—General Electric's automatic electronic component assembly machine, slated for completion next summer, will be able to place 1,600 components per hour in printed circuit boards, operating from punchcard instructions, a spokesman recently reported. The machine, first revealed in AVIATION WEEK Nov. 17, 1952, p. 36, is designed for small production runs and quick change-over. Program is sponsored by Signal Corps.

▶ **Midget Radar Scanner**—Lightweight gyro-stabilized X-band radar antenna which weighs only 18 lb. has been developed by Magnavox's government division. Several aircraft manufacturers are reportedly eyeing the device for use in new airframes. —PK

feet to safety

With pressure from the pilot's feet, tons of metal are brought to a fully controlled safe stop. Planes are landing faster and hotter, but with continually improved mechanisms such as Gladden's brake control units, greater power to control and stop is now possible. Gladden's ability to anticipate the requirements of the aircraft industry has made them a leader in the manufacture of brake control units. Today Gladden is in quantity production on the three major types of brake control units . . .

- Master brake cylinder
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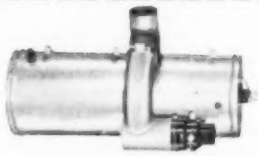

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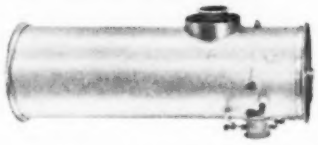

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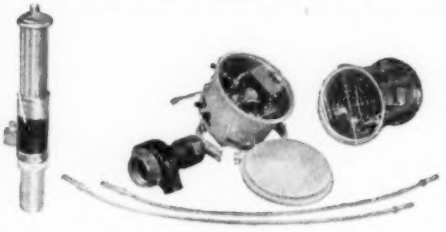

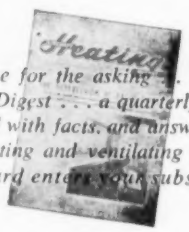

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THEY PRESENTED PAPERS—From left, D. M. Moore, Convair; E. Pfafman, Boeing; W. W. Thayer, Douglas; E. W. Kesselman, Lockheed. At right is Vickers' F. T. Harrington.

Experts Examine Hydraulic Trends

Vickers conference hears papers delivered on Boeing, Convair, Douglas and Lockheed transport aircraft.

By George L. Christian

Detroit—Latest design trends in hydraulic components, airline experience with flame-resistant hydraulic fluids, and new developments in flexible aircraft hose were among the subjects discussed at the Transport Aircraft Hydraulic Conference held here recently under Vickers, Inc.'s sponsorship.

The conference attendance was close to 100, including representatives of the airlines, airframe manufacturers, and related industries. Chairmen were F. T. Blum, hydraulic systems engineer, United Air Lines, and R. F. Stapells, mechanical systems engineer, Canadair, Ltd.

▶ **Paper Presentation**—Four papers were delivered at the conference. Previous meetings have usually been question-and-answer discussion affairs. One of the papers—an analysis of the hydraulic system of Boeing's 707 jet tanker/transport—was covered in detail in AVIATION WEEK Dec. 6, p. 87. Brief summaries of highlights of the other three papers presented at the meeting follow.

• **Modification of the Model 340 Main Hydraulic System to Improve Ground Cooling Operation,** by D. M. Moore of Convair.

The modified hydraulic system provides these advantages:

Hydraulic system unloading cycles have been reduced by 99%; pressure peaks in the return system have been lowered and unloading valve shock wave to motor drive valve seals has been eliminated; fan motor pulsations have been damped, and fan motor noise reduced.

• **Hydraulic Aspects of the Douglas Cabin Supercharger Drive (From the DC-6 Through DC-7),** by W. W. Thayer of Douglas.

Development and service problems inherent in creating new models of cabin superchargers for improved models of aircraft were discussed. Thayer presented curves to illustrate how supercharger overhaul times have consistently improved with each design change. He said that a new modification is now being incorporated in the supercharger drive system to eliminate air from the system and improve operating characteristics of the drive. The DC-7s now building will have larger-capacity variable displacement hydraulic pumps in the cabin supercharger drive systems.

• **Recent Developments for the Constellation Main Hydraulic System,** by E. W. Kesselman of Lockheed.

The paper spelled out several Connie and Super Connie hydraulic system improvements, including faster landing gear retraction to improve the plane's takeoff characteristics; a new hydraulic crossover system which allows either of the plane's two hydraulic systems to feed the other in case one fails. (Previously the secondary system, which operates all standard services such as landing gear, flaps and brakes, could feed the primary system in case it failed; however, the primary system could not feed the secondary system.)

Other improvements include the installation of Vickers' new lightweight hydraulic pumps and the incorporation of an electric motor-driven hydraulic pump for emergency landing gear extension and brake operation.

Highlights of the question-and-answer sessions follow.

Pumps & Motors

Vickers says that the basic design criterion of variable-displacement hydraulic pump bearings (a critical item) is a life of 1,000 hr. with the pump operating at 3,000 psi. Pumps installed in cabin supercharger drives are expected to have a life expectancy at least equal to the supercharger drive and other components.

▶ **Long-Life Aim**—In actual practice, engine-mounted pumps that are used to supply a plane's main hydraulic system have a life ranging from 1,100 to 1,800 hr., according to Vickers, since common airline practice is to keep pumps on for an engine's overhaul period.

Trans World Airlines commented that Vickers' goal should be to produce variable-displacement pumps which consistently operate for an engine's overhaul period—a goal which Vickers apparently has reached with several pump models, according to the airlines.

In regard to hydraulic motors, Vickers says that it has two improvements in the works. The pump block is now being made out of an aluminum-nickel-bronze alloy instead of bronze only. The new blocks have stood up well in qualification tests, according to Vickers. And the cylinder bores are being given a "bearingizing" finish to give the bores a surface finish of 5 micro-inches. These two changes should help materially in prolonging motor life.

Hydraulic Fluids

From discussions at the conference, it was apparent that fire-resistant hydraulic fluids are not taking the aviation industry by storm. It also appears that Monsanto's Skydrol is in the lead.

The fluid was recently accepted by USAF for cabin supercharger drives on production Douglas C-118As. All existing C-118As soon will be converted to Skydrol in the field, according to Monsanto spokesmen. The Navy is considering making the same change, Monsanto says.

▶ **Low-Temperature Fluid**—Monsanto also indicated there is considerable interest in England in its low-temperature version, Skydrol 500, whose temperature range is from −65 to 225F. Skydrol

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500 costs $3 a gallon more than standard Skydrol.

Still another Monsanto fluid, OS45, is attracting interest in military circles, the company reports. In some cases the military are more interested in a high-temperature fluid than a flame-resistant fluid and OS45 was developed to meet this need.

Hollingshead's flame-resistant hydrolube fluid, H2, is still being used in some operational Navy aircraft, but is not being pushed, according to a company representative. The fluid is not being used on any production planes and is probably on its way out, he conceded.

► **Users' Comments**—Here are some comments made by various technicians concerning Skydrol:

• **Douglas:** Skydrol apparently lacks lubricity under certain loading conditions. Case in point is the windshield wiper assembly on DC-6s where side loads are applied on a hard bronze rack riding in a soft aluminum body. Excessive wear results. Douglas silver-plated the rack, hard-anodized the body bore, and redimensioned the piston and rack to alleviate this trouble.

Douglas says that it will perform Skydrol tests on any unit intended to work in or with the fluid if the unit's vendor cannot afford a Skydrol test bench. Tests must be performed before components are allowed to be incorporated in aircraft hydraulic systems.

• **Delta-C&S, National:** Cabin supercharger drive systems on their Convair 340s have been converted from Skydrol to Aeroshell 1-AC.

• **KLM, PAA:** Landing gear struts of their DC-6-type aircraft have been converted from Skydrol back to mineral oil because the O rings did not hold up satisfactorily.

• **PAA:** The carrier says that it analyzes, refilters and reuses quite a lot of Skydrol and thus saves an appreciable amount of money. Several other airlines, including United and American also reclaim Skydrol. PAA says that it has a minor problem with Skydrol getting into mechanics' eyes and wants to know if Monsanto can come up with a good eyewash.

• **PAA, UAL:** Both carriers agree that using Skydrol has increased maintenance costs on the aircraft.

Several factors enter into this: Electrical wiring exposed to the fluid has to be covered with nylon or Teflon; duplicate equipment is needed to handle two types of fluid; occasionally using non-Skydrol units in a Skydrol system because of emergency requirements can be expensive; and the fluid itself costs $12 a gallon.

But United's representative says his company feels that the fire-resistant quality of the fluid, especially when used in the cabin supercharger drive system, is worth the extra cost.

• **Delta-C&S:** Cat-A-Lac paint, made by the Finch Paint and Chemical Co., Gardena, Calif., is giving excellent results when used in Skydrol-affected areas, the carrier reports. It is almost completely resistant to Skydrol's paint-removing characteristics. United concurs that the paint is good, but does not use it because of the paint's "prohibitively long drying time." While on the subject of paint, Monsanto advises that a different type of paint is required with Skydrol 500 when used at high (180-200F) temperatures.

Some airlines complained that Skydrol posed a problem when used in aircraft brake systems, especially when brakes are parked and the fluid is exposed to the high temperatures of just used brakes. However, both Douglas and Monsanto say that they have tested the fluid in brake systems of DC-6 aircraft and have had no problems.

► **High Temperature & Acid**—Several airlines commented on Skydrol's reported tendency to turn acid when exposed to high temperatures. PanAm has noted this tendency in its operations while United has had acidity problems in its Skydrol test bench.

Here are Monsanto's views on acidity and high temperatures as expressed by the company's representative: He does not think that Skydrol can go beyond its present operating temperature limits which are −40 to 225F in an open hydraulic system and −40 to 250F in a closed system. Nor is Monsanto making any attempt to raise Skydrol's operating temperature limits.

Exhaustive laboratory tests have shown that it takes three days of operating the fluid at a constant temperature of 120C to raise the acid number to 1.0. The company says that continuous operation at over 300F is required to turn Skydrol acid.

► **Douglas in Favor**—Douglas, which did a considerable amount of work in the original development of Skydrol, underwrites the fluid wholeheartedly and comes out strongly in its favor.

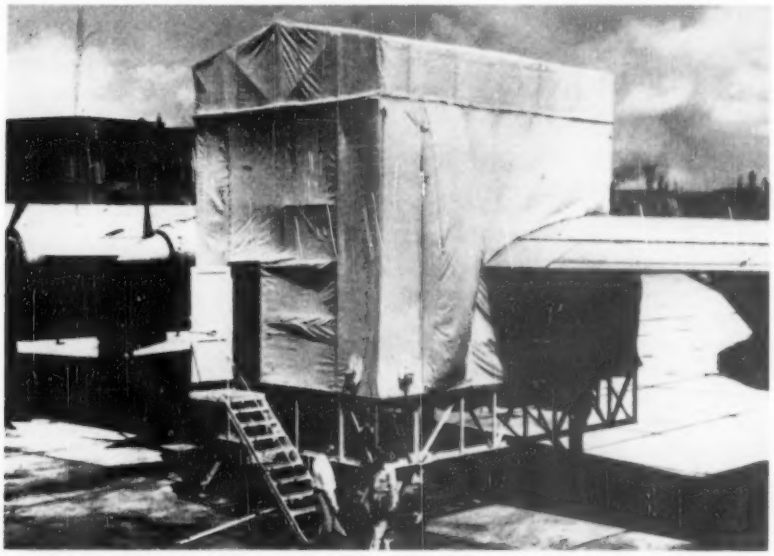
The Douglas rep cited a test his company made in which a Vickers hydraulic pump was operated for a considerable period of time using Skydrol with a 190F inlet temperature without encountering any acidity problems. "Skydrol life is excellent," he said.

► **Wire Covering**—As to wire covering to protect insulation against Skydrol, United says that heavy-jacketed nylon covering gives excellent protection against both Skydrol and mineral oils. The airline's experience with light-jacketed or spray-on nylon is not satisfactory. Yet KLM and American find spray-on nylon gives adequate protection.

Other comments concerning Skydrol:

• **Lockheed:** Have run limited tests; the fluid is not approved.

• **Boeing:** Currently conducting tests; fluid is being specified for the 707 at



New Wrap-Around Shelter for B-36 Servicing

Air Force has placed an order for a "substantial number" of these new J-2 wrap-around maintenance shelters for use by Convair B-36 ground crews. In normal weather it takes only five minutes to install the unit in place, the maker notes. The steel structural framework is covered with nylon curtains that can be buttoned snugly around the aircraft's structure. Space is sufficient for rotating a propeller 360 deg., or for removing an engine or prop. Manufacturer of the weathertight maintenance shelter: Luria Engineering Co., Bethlehem, Pa.

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• **Monsanto:** quoting an airline: "Skydrol saved $70,000 when used in 75 cabin supercharger drive systems."

Seals

Some of the highlights concerning hydraulic system seals:

New "Delta" O rings offer better spiraling characteristics than standard, round-shaped O rings. However, they also offer more resistance to piston action.

The Air Force advises that it has experimented with the Delta O rings in the outrigger landing gear struts on B-47s. Delta rings did not give as good results as standard rings so the Air Force returned to the round O ring. Another disadvantage of the ring is that it can easily be installed upside down.

PAA says that Skydrol seals are adversely affected by heat and asked when better seals would be made available. Douglas answered that part of the answer is in better quality control which should include a 72-hr. hot (approximately 100F) Skydrol soak.

Goshen Rubber Co., a major supplier of O rings, said that O rings should be used in moving applications, square section seals in static uses.

Aircraft Hose

Two major aircraft hose suppliers, Aeroquip and Weatherhead, gave these details of developments in their plants:

• **Aeroquip** revealed that it has two radically new, high-temperature hose developments in the works, but cannot decide which to push until it has a clearer idea of what kind of fluids and what maximum temperatures the hose will have to handle.

• **Weatherhead** is working with three different types of hose. The company may soon be able to supply ½-in. hose capable of withstanding pressures up to 4,000 psi. with a 125% momentary overload. It also hopes to have a new —10 MIL-5511 hose available by the first of the year for propeller feathering applications. The company has developed a —8 hose which it believes will withstand 4,000 psi. (with a 125% momentary overload) for 100,000 cycles. The hose is not yet available for sale.

Aeroquip also has a hose construction which looks suitable for such pressures, but says it has had no inquiries for 4,000-psi. hose.

Sidelights

Discussions on airline procedure concerning ferrying Constellations with hydraulic system failure brought out the following:

• **TWA** will allow ferry flights with one

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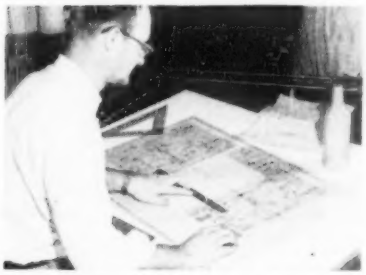

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hydraulic pump inoperative.

• **EAL** requires that both secondary system pumps must be operative for ferry flights. It is permissible to pull one primary pump to replace a defective secondary pump for ferrying.

• **Lockheed recommends** that flights be made only with all four pumps operative.

▶ **Seal Leakage**—To correct hydraulic pump shaft seal leakage on 1049 Super Constellations, Vickers is testing seven different compounds. Company believes that the answer will be in a more heat-resistant material.

An "unaccountable drop of hydraulic fluid level in flight" on 1049C Super Connies was explained this way: If the hydraulic system is not bled after repair, air remains in the fluid. Fluid level in the tank drops as soon as the system is pressurized.

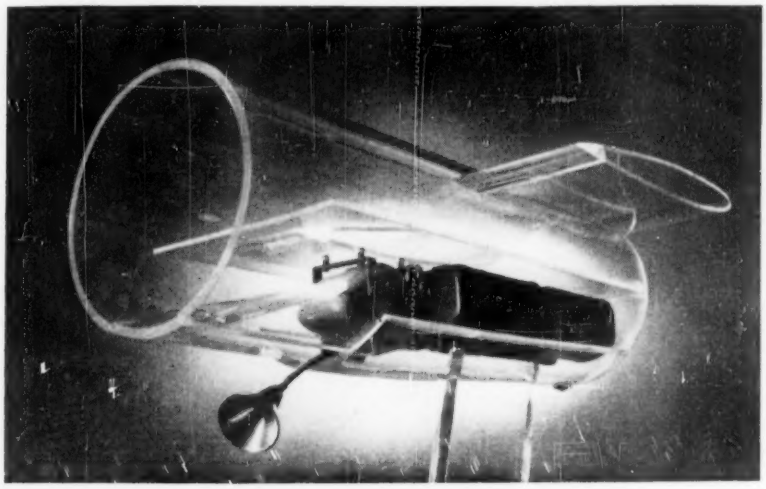
United says that the rotating group seals in its pumps, which lasted for three engine runs when used with mineral oil, now last only two runs when used with Skydrol. Vickers explained this by saying that the seal elements tend to soften more readily when exposed to Skydrol.

Vickers has instituted more rigid quality control for diaphragms going into its accumulators. Two diaphragms from each batch received are given accelerated tests, including an oil soak, sectioning and careful inspection. If a failure is detected, the whole batch is rejected.

The newly designed body of the Vickers AA-34554 valve has completely eliminated cracking which had occurred in the passageway between the accumulator port and upper chamber, airlines report.

PAA and AA would like new brake valves for the DC-6 and —6B; NAL is happy with theirs. PAA says it cannot keep the setting on the valves, big variations occur from one check to another. UAL agrees, saying that the currently used valve is extended to its absolute limit.

Annealed steel air lines in the Boeing 707 and B-47 hold 3,000 psi. air well, a job no aluminum lines could do, according to Boeing's representative.



Kit Makes Any Bomber a Tanker

(McGraw-Hill World News)

London—A refueler pack designed to make any bomber an aerial tanker has been developed in Britain by Flight Refuelling, Ltd., Blandford, Dorset, England.

The picture above shows a scale model of a section of an aircraft's fuselage with the "package" unit in position in the bomb bay on the underside of the belly.

Based on the probe and drogue system of flight refueling, the pack combines the hose reel unit from which the drogue is trailed and the fuel supply tanks in a single unit, eliminating the necessity to draw on the aircraft's own fuel supply for the refueling operation.

Its design as a self-contained unit also makes it unnecessary for aircraft already equipped for ground pressure refueling to be specially converted or designed for tanker duties. The unit is virtually a piece of auxiliary equipment for use as and when required. It is transported on a dolly and hoisted into the underside of the aircraft's belly, just as bombs are hoisted. Special fittings in the aircraft hold it in position.

The hose reel mechanism is driven off the aircraft's normal electric system into which the pack's electrical system is plugged. Hose trailing and rewinding are controlled from a small switch panel in the crew compartment. Simi-

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Silicone News

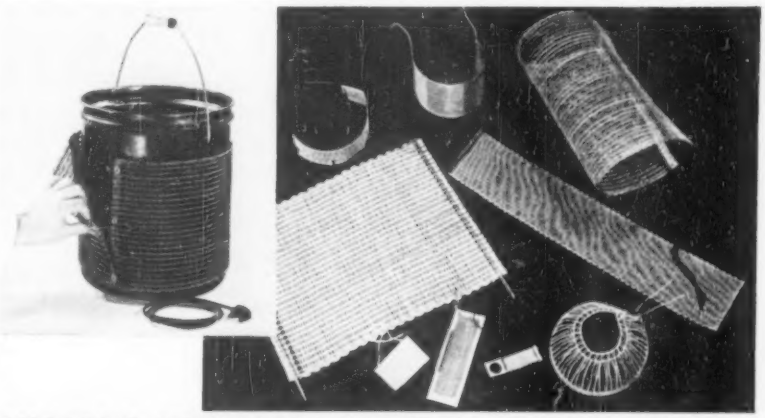
FOR DESIGN ENGINEERS

Silicone-Based Paint Withstands Up To 1000 F On Oven Interiors

Especially adapted to preheating and stress relief of small parts, the new Grieve-Hendry cabinet drawer electric oven has a capacity of 850 F. It is so well designed that any one of the 24 drawers may be opened without lowering the temperature of the remaining drawers.

The service life of the oven is increased by finishing the interior of each drawer with a silicone-based aluminum paint formulated by Midland Industrial Finishes of Waukegan, Illinois. Grieve-Hendry has been applying this silicone finish to the interiors of all their oil, gas and electric ovens for over 3 years. Easily applied by spraying to form a smooth and uniform coating, the silicone paint protects the metal surfaces against corrosion at surface temperatures up to 1000 F. *No. 15*

New Pressure Sensitive Adhesives that stick to almost any material remain serviceable and can be applied at temperatures from —67 to 480 F. Uses include bonding silicone treated electrical insulating materials, sealing and wrapping tapes and assembly of small electronic parts prior to mechanical installation. *No. 18*



SILICONE INSULATED WOVEN HEATERS PROVIDE MORE EFFICIENT METHOD OF CONTACT HEATING

Woven contact heaters, once reserved exclusively for the military, are now being offered for a variety of industrial applications. One of these is a 5 gallon drum heater developed by the Pre-Fab Heater Company, Inc., of Guildford, Conn. Designed to melt drums of plastisol, this lightweight heater brings the contents of the drum to temperatures in the range of 110 to 500 F with maximum speed and uniformity. Safe and convenient, the heater snaps in place around the drum and plugs into any 115 volt outlet.

Contact heaters of this type were orginally developed to keep high altitude aerial cameras and control mechanisms operable at sub-zero temperatures. Lighter, less bulky and more flexible than conventional heating pads, the heaters are custom woven to fit the part. Some of the dozens of configurations and patterns developed for military use are shown above. These heaters, operating in the far infra-red range at high efficiencies, carry current-densities of 15 watts per square foot to 15 watts per square inch.

The wires in the heaters designed to meet military specifications, are served with glass yarn impregnated with Dow Corning silicone electrical insulating varnishes to assure long and reliable performance at temperatures in the range of 500 F. The silicone-glass combination eliminates electrical breakdowns caused by sudden and extreme changes in ambient temperatures. It withstands heavy thermal shock without loss of electrical properties.

Another feature of importance to designers is that only slight consideration must be given the heater when designing parts or products requiring this protection. The thin structures are easily tailored to meet specific needs. *No. 16*

Pressure Cooker Gaskets of Silastic Last Longer, Reduce Clean-up Time

The new pressure cooker made by the Hamilton Copper & Brass Works of Cincinnati, features a steam jacket that heats the entire inner bowl. Designed for internal kettle pressures up to 15 psi and steam pressures up to 90 psi, the cookers are sealed with a Silastic* gasket fabricated by Garlock Packing Company.

Tests indicate that the Silastic gaskets will have at least twice the service life of the organic rubber seals previously used. Furthermore, even foods as hard to clean off as tomato paste or candy do not stick to the gasket. Cleaning time is reduced and the carry-over taste associated with organic rubber gaskets eliminated. *No. 17*

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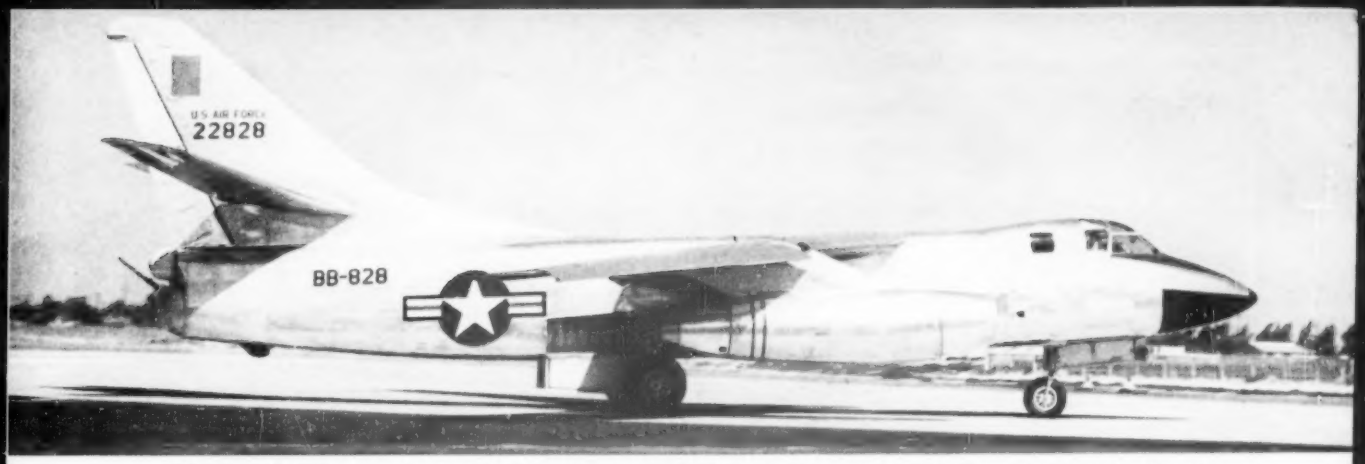
Douglas B-66 takes off at Long Beach, California, for its test run. Its electrical system was designed by G-E application engineers to deliver rated load with 80° C cooling air.

GENERAL ELECTRIC



Side view of bomber shows sleek lines. It is first production aircraft to have an elevated ambient temperature a-c electric system.

Latest Air Force bomber has new G-E engineered power-generating electric system

NEW GENERAL ELECTRIC ENGINEERED SYSTEM MEETS DOUGLAS B-66 OPERATIONAL DEMANDS FOR HIGHER AMBIENT TEMPERATURES

A new a-c electric power-generating system has been developed by General Electric, and is now operating on the Air Force's newest light bomber, the Douglas B-66. The system consists of three major components: high-efficiency alternators, static voltage regulators, and generator control and protective panels.

DESIGNED FOR HIGH PERFORMANCE AIRCRAFT

With a generator that can operate at high ram-air temperatures of high speed flight, the new G-E system is designed for long life and reduced maintenance time. Its static voltage regulator has no moving components to wear out, and under laboratory testing it has withstood 5000 hours of operation without maintenance.

Regulation is preset, and requires no pilot adjustment of voltage or load division. The control panel supplies the automatic control of start-up, shut down, and maximum protection against ground fault, over and under excitation, and open phase.

SPEEDS TAKE-OFF, SPARES PILOT

The new equipment begins operating as soon as the pilot starts the engine. The system contains only two toggle switches, which may remain "on" at all times, even when a fault develops. This eliminates a series of pilot functions and sharply reduces the time required to become airborne. Under normal conditions, fault clearing and resetting are fully automatic.

SINGLE SOURCE FOR COMPLETE SYSTEMS

General Electric offers a single source for complete a-c or d-c power generating systems and constant speed drives for most aircraft. For more information, contact your nearest G-E aviation specialist, or write Section 210-92, General Electric Company, Schenectady 5, N. Y.

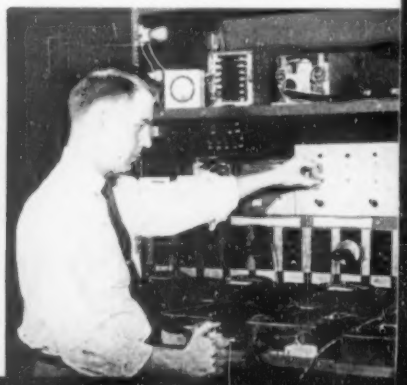
Progress Is Our Most Important Product

GENERAL ELECTRIC

Static regulator (left) maintains constant alternator output voltage. Control and protective panel (right) helps locate and isolate faulty generation.

New G-E high-efficiency a-c generator has no harmonic over 1%; produces full rating when exposed to high temperatures in high speed aircraft.

Tests of system showed better protection against over voltage, over and under excitation, ground fault, anti-cycling, difference current, and open phase.



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Here's another Aerojet-General JATO tailor-made for a specific task—to get Navy carrier-borne jet bombers into the air quickly, safely, and with full payload.

Tailor-made for the *task*, yes, but mass-produced by Aerojet-General with the same high quality, excellent reliability, and broad operating characteristics proved time and again by over 300,000 rocket powerplants produced by Aerojet-General for the Services.

This new high-thrust, short-duration JATO—designated the 5KS-4500—developed by Aerojet-General in cooperation with the U.S. Navy Bureau of Aeronautics, is one of many different solid-propellant rocket units produced by Aerojet-General to fulfill specific needs.

If you are concerned with missile powerplants or boosters, assisted takeoff or in-flight thrust-augmentation for piloted aircraft, auxiliary power supplies, gas generators, turbine starters, pilot ejection, or any problem that demands *full* power *within a second*, Aerojet-General's rocket power specialists are ready to assist you.

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MORE POWER FOR AIR POWER

larly, the unit's fuel tanks can be connected to the aircraft's fuel system to provide extra transfer fuel should it be required after the "pack" unit's tanks have been exhausted.

In the photo (p. 64), the hose has been extended a short distance to show the drogue attachment into which the pilot of the aircraft to be refueled flies the probe. The probe is normally positioned in the nose of the receiver aircraft; it can also be positioned on the leading edge of the wing, on tip tanks, or elsewhere.

The unit can be installed in 30 minutes, its maker says.

OFF THE LINE

Airwork Corp. has opened a branch facility at Newark Airport. Designed to serve customers in the New York-New England area, the branch will have an office to handle spare parts sales for 16 manufacturers. Sales office will be in Building #8 on the east side of the field.

A 30,000-ft. drop, imposing forces of about 1,000G, failed to damage seriously a Silvercel storage battery made by Yardney Electric Corp., the New York firm says. One of its 40-amp. hr. batteries was carried 5½ miles high by a research balloon. At 30,000 ft. its instrument pack was released. Due to parachute failure, the entire pack, including the 5¼-lb. battery, plummeted to earth. When recovered, the battery's storage cells showed only minor damage to the housing—the battery itself retained full output and performance characteristics, according to Yardney.

Test, repair and general servicing facilities for aircraft parts are being established in the Los Angeles area by Pesco Products. Named Pesco Pacific Service Center, this unit is the second extension of Borg-Warner aviation activities on the West Coast, the company having recently acquired Weston Hydraulics, Ltd. Address of the Service Center: 5521 Cleon Ave., North Hollywood, Calif.

An AiResearch cooling turbine recently operated 14,200 airplane hours in a United Air Lines' DC-6 without overhaul. Record was set during a test of grease-packed bearings used in the machine where the turbine operates at approximately 17,500 rpm. AiResearch engineers who dismantled the unit said that the parts were still in serviceable condition, met all specifications, "and the turbine to all appearances could have operated for a longer period without trouble."

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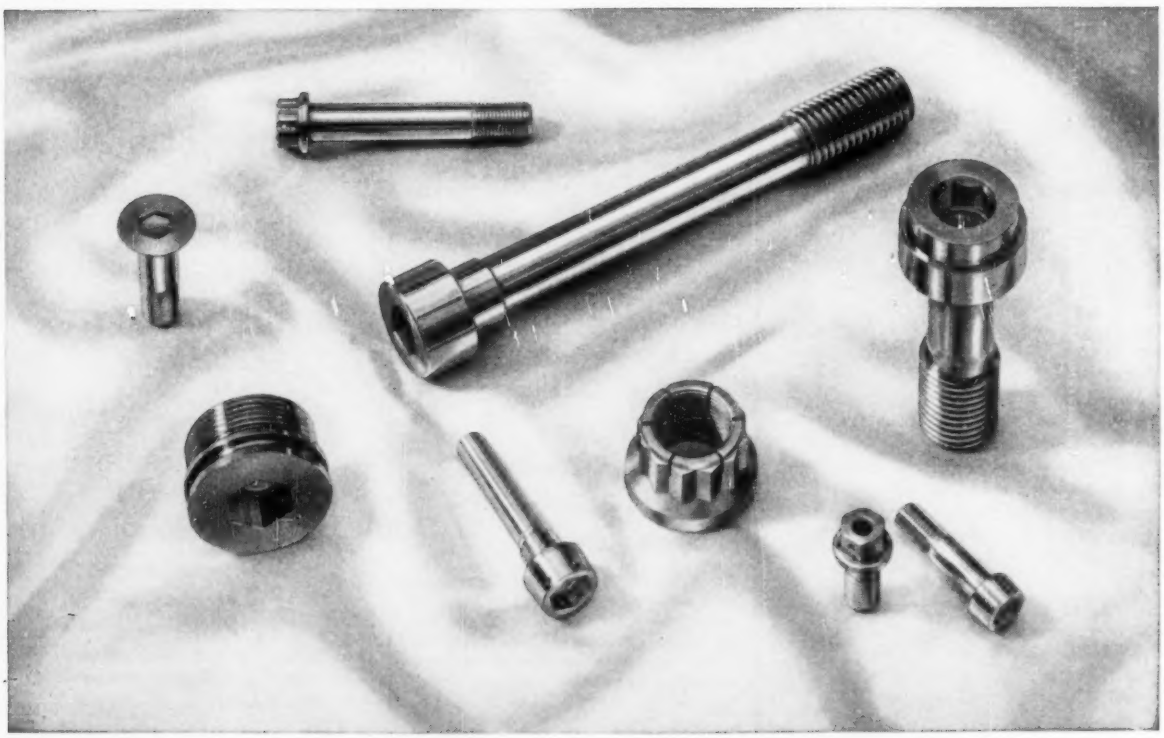

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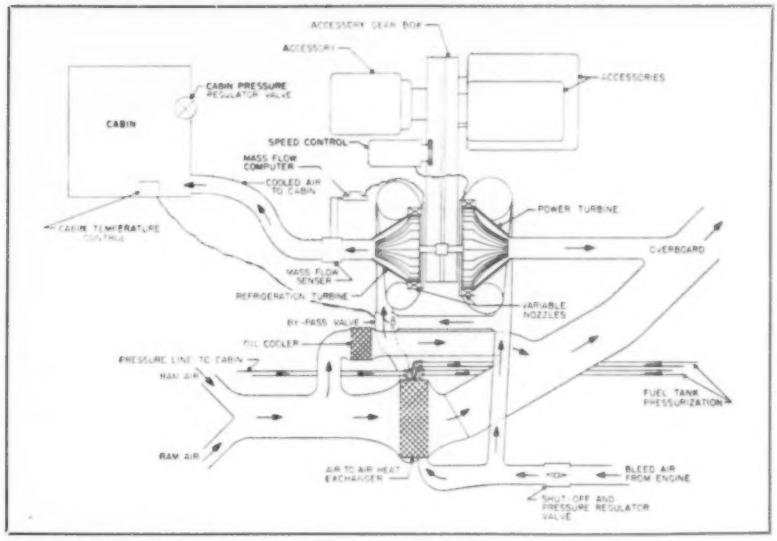


FRIJADRIVE handles cabin air conditioning, provides accessory drive power.

Twin Turbine Supplies Air, Power

A new twin-turbine system, developed by Hydro-Aire under contract with a major airframe manufacturer, provides both air conditioning and accessory-drive power for aircraft.

Known as Frijadrive, it is reported to be the first twin-turbine system to combine these functions. It is designed to satisfy rigid cabin temperature requirements for a large range of inlet conditions, while developing shaft power at constant speed in accordance with constant or variable load requirements.

▶ **Better Bleeding**—By utilizing two turbines instead of one, the Burbank, Calif., manufacturer has gotten optimum design for the refrigeration requirement without compromising for the variable power requirement. In turn, any output required is not penalized by loss of available energy resulting from loss of heat through a heat exchanger and increased turbine back pressure due to cabin pressurization needs.

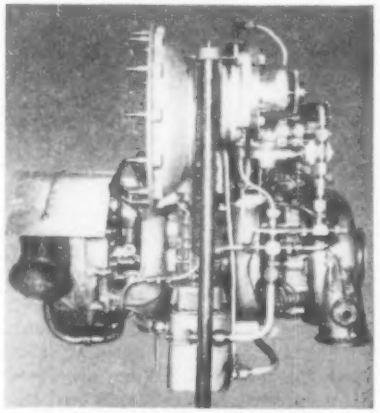
Net effect is reported to be a more efficient use of bleed air for a given set of requirements over a range of operating conditions.

Basically, the system consists of two turbines mounted on a single shaft, a gear box, heat exchanger and controls. The cooling turbine wheel is a high-performance, radial-flow, aluminum alloy unit. Scroll is the low-velocity type. Variable nozzles are airfoil-type profiles supported on individual bearings.

Power turbine wheel also is a high-performance, radial-flow design made up in stainless steel. Scrolls and variable nozzles are similar to those in the cooling turbine, but adapted to higher temperature levels.

▶ **Two Air Paths**—Compressed air bled off the engine is split into two ducts—one directs the air through and/or around the heat exchanger, then through the cooling turbine and into the cabin; the other duct directs the air into the power turbine.

Heat taken out in the exchanger is given to ram air passing overboard through the exchanger. Bleed air coming out of the exchanger, still too hot for air conditioning, is expanded through the "cold" turbine, where energy is removed, lowering the temperature. This energy is, in turn, used to drive the accessories.



TWO-IN-ONE TURBINE UNIT makes efficient use of bleed air.

The control system then regulates the additional power required from the other turbine (power turbine) or, if there is excess energy, causes the power turbine to act as a brake.

If the cabin temperature drops below the desired level, the bypass valve automatically (or at pilot's discretion) routes a portion of the air past the exchanger.

The Frijadrive package so far developed provides an air-conditioning flow controllable from 30 to 60 lb. per min. with loads from zero to 80 hp.

Pilot Light Assemblies In Subminiature Series

A series of pilot light assemblies a little over 1 in. high, mounting in a single 15/16-in. clearance hole and requiring no insulating mountings, provides omnidirectional visibility because of the stovepipe-shaped cap of high-heat plastic into which the bulb extends.

Two terminals are provided. The mounting bushing may be grounded to the panel and the integral insulation of the subminiature pilot light completely isolates the lamp circuit from the ground. The series is designed to use any of five standard midget flanged base incandescent lamps of these voltages: 1.3, 2.7, 6.0, 14.0 and 28.0.

Caps may be transparent, light diffusing or completely diffusing. Clear or any of six colors may be specified.

Dialight Corp., 60 Stewart Ave., Brooklyn 37, N. Y.

Easy-to-Use Shift Lever Feature of New Metal Lathe

A lathe designed to meet the needs of tool and die shops and industrial working facilities is the first product of its kind being built by the Delta Power Tool Division of Rockwell Manufacturing Co.

The lathe is an 11-in. cabinet model with 24-in. capacity to centers and 1-in. collet capacity. Diameter of the hole through the spindle is 1⅛ in.

Prime feature of Delta's new product is a patented back gear shift lever located so that the operator can reach it easily and shift from direct spindle drive to back gear spindle drive, loose or locked spindle without using wrenches, pulling out pins or opening guards.

The machine also has a perfected vari-speed drive, the company notes, offering a 44-to-1,550-rpm. speed range with an infinite choice in that range, without turning off the machine to change speeds. Difficulties formerly associated with vari-speed drives, such as side sway, have been eliminated, the maker reports, enabling the drive to

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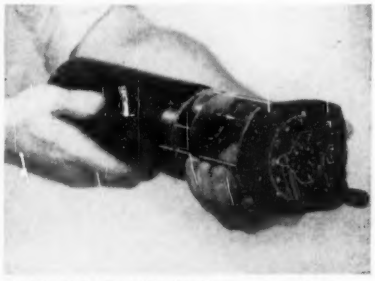
run cool and retain its lubricant.

Operators are offered a choice between 24 in.-8 threaded and L00 long-taper spindle nose. A total of 48 thread and feed changes is offered with thread range from four to 224 and feed rate revolution from 0.0902 to 0.0016 in. longitudinal and 0.0301 to 0.0005 in. across.

Accessories include a new taper-turning attachment, also micrometer stops, milling attachments and a standard type of collet chuck.

Delta Power Tool Division, Rockwell Manufacturing Co., 438 North Lexington Ave., Pittsburgh 8, Pa.



ELECTRONIC SIGNALS move pointer.

Simulator Instruments Duplicate Real Thing

Link Aviation, Inc., maker of on-the-ground aircraft trainers and simulators, has developed a complete line of simulator instruments which respond to electronic signals rather than natural physical forces.

The units are designed to simulate all aircraft instruments, but are said by Link to be readily adaptable for use in other specialized applications. Among those who might find the simulator instruments valuable are makers of trainers and simulators, computer manufacturers, aircraft design groups studying flight performance, radar trainer designers, government laboratories and project engineers.

The Link instruments can be activated by common type synchros or servos.

Link Aviation, Inc., Binghamton, N. Y.

Airline Survival Raft Holds 25, Weighs 123 lb.

A 25-man liferaft for civil airline use, weighing only 123 lb. with all accessories, has been put on the market by Air Cruisers Division of the Garrett Corp.

All external lines which could foul launching and inflation have been eliminated, the maker notes, while an automatically ejected sea anchor quickly retards inadvertent drift. Centralized survival equipment stowage can double as an insulated area for disabled or shocked survivors. A simplified canopy provides shade area.

Accessories include water desalting kits, rations, flares, oars, sea anchor, survival booklets, first-aid kit and bailing bucket.

Air Cruisers Division, Garrett Corp., Belmar, N. J.

ALSO ON THE MARKET

Cellular stainless steel mat, being developed for jet planes, rockets, missiles, can be used for hot or cold service for tailpipe shrouding, afterburner cases, leading edge sections, and other applications requiring good corrosion resistance with lightness and strength. Both the honeycomb interior and the .002-.003-in. panels are made of 17-7 PH stainless steel.—Armco Steel Corp., Middletown, Ohio.

Ceramic-to-metal seals that can withstand temperatures up to 1,400F and pressures to 2,000 psi. are made possible by Advac metalizing process. Complete line of standard seals is available. Custom seals are fabricated for special requirements.—Advanced Vacuum Products, Inc., 18-22 Liberty St., Stamford, Conn.

Thread lubricant for use with titanium, stainless steel and aluminum comes in two grades in easy-to-use tubes. Blue Goop grade is for temperatures up to 400F; Silver Goop is for temperatures up to 2,100F—Crawford Fitting Co., 884 E. 140th St., Cleveland 10.

Fyre-tite fire wall seals are fireproof under 2,000F direct flame for 15 minutes. They are made of specially formulated sponge rubber encased in fiber glass fabric, and can be fabricated to specific requirements.—Arrowhead Rubber Co., Long Beach, Calif.

Many a manufacturer has chosen Packard cable and wiring assemblies solely because of Packard's uniform high quality—and has been pleasantly surprised to receive important *extra advantages*. For Packard provides experienced engineering counsel, production capacity sufficient for any need, and assured on-time delivery . . . and often it is intangibles such as these that help keep your production lines going.

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The widespread use of Packard cable and wiring assemblies, by America's foremost automotive, aviation and appliance manufacturers, is your assurance of high quality. And, because Packard is equipped to turn out 7,000,000 feet of finished cable and 800,000 wiring assemblies *daily*, you can depend on unfailing delivery. In addition, Packard's large staff of engineers is ready to serve you at any time. Call on them—preferably while your new product or model is still on the drafting board. Their long experience in designing and fabricating cable and wiring assemblies can well result in important savings to you.

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Although jet ignition is a comparatively new development in the fifty year span of powered flight, progress in this vital phase of aviation has been truly remarkable.

Unlike ignition design for reciprocating engines, which has remained relatively constant, jet ignition has gone through several major design changes within the past few years.

For example, a comparison of the TLN-10 jet ignition system, produced by the Scintilla Division of Bendix, with earlier designs shows significant improvements in every operating characteristic —and at the same time original cost, operating expense and weight are substantially reduced.

Here, indeed, in the Scintilla TLN-10 jet ignition system, is a classic example of how the present national policy of greater value for the taxpayer's dollar is being put into practice.

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TLN-10 SYSTEM

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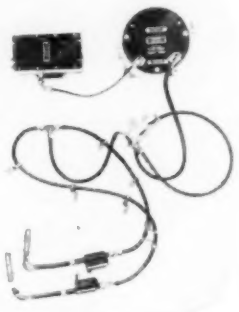
- Smaller size—Easier installation—Leads used will withstand exceptionally high temperatures—TLN-10 System is engine mounted whereas TEN-1 was both plane and engine mounted.



EARLY DESIGN

WEIGHT 37 LBS.

Air Transport Assn. Says:

Some Airline Profits May Dip Below '50

- **Earl Johnson tells CAB scheduled carriers will end year at about same net level as four years ago.**
- **Static fare structure is blamed as major stumbling block to adequate earnings, independent investment.**

By Frank Shea, Jr.

Despite a 100% increase in business over the past four years, the U. S. scheduled airline industry will end up with approximately the same net operating income this year as it realized in 1950.

"Does this mean that there are airline managements and corporations that are going to earn the same in 1954 that they earned in 1950?"

The incredulous interrogator was Civil Aeronautics Board member Joseph Adams. His question was addressed to Air Transport Assn. president Earl D. Johnson. The occasion: ATA's second presentation of the year before CAB on the economic condition of the domestic trunkline industry.

Johnson's answer to Adams was in the affirmative. He indicated that many carriers would consider themselves lucky if they did not dip slightly below the 1950 net.

▶ **Skidding Profits**—Thus, the ATA president made his point before the one body empowered with authority to take corrective action on the problem of skidding airline profits.

The solution sought by ATA is no secret. Johnson repeatedly has made it plain that the static level of airline fares is the major stumbling block to adequate earnings for carriers.

It also is no secret that the industry's inability to realize adequate earnings has been its big problem in attempting to stimulate independent investment.

▶ **'Hard, Cold Facts'**—Not once in his extensive presentation did Johnson come right out and ask the Board to consider a direct fare increase. CAB's negative attitude on this subject already is a matter of record.

He did, however, present his case conclusively and left no doubt as to what he was trying to point up.

As one observer said: "Johnson dealt in hard, cold economic facts. His presentation will bring most people to the realization that this narrowing profit margin is an alarming situation which the airlines cannot handle alone. It's the Board's move now."

▶ **Cost Problems**—Johnson's overall presentation was built around cost, management's appraisal of costs and how they build into the entire expense picture. In his previous presentation, last May, he had stressed primarily sources of income.

To illustrate some of the cost problems, he cited the following:

- The average airline fare per mile has declined steadily until it now is only 3% higher than the 1938 level. This has been due chiefly to the introduction of aircoach and the impact of the family plan.
- In other forms of transportation, however, bus fares show a 27% increase over the 1938 level, while rail fares show a 35% jump.
- In contrast to the static air fare ceiling, both consumer prices and airline salaries continue upward.
- Overall high operating costs show little sign of taking a downward turn.

"Growth, in itself, generates expenses," Johnson told the Board. "In addition rapid improvements in technology are crowding us all the time." To illustrate, he cited the following examples of generated costs:

- Fuel costs have increased since the war. One major airline's fuel expenditures have nearly doubled in proportion to total expense, rising from 7.6% in 1946 to 15.1% in the 12 months ended June 30, 1954.
- Airline training costs have skyrocketed. The average cost per pilot for recurrent training in 1940 was $175. Average cost today is $600.

In 1940, the total cost for recurrent training of pilots for the scheduled domestic industry was $338,000. This year, the same cost will hit $4.5 million. (This is just for keeping a man current and does not include upgrading from DC-3s to DC-4s to DC-6s, etc.)

Member Josh Lee was somewhat

Trunkline Revenues vs. Expenses

		Per revenue ton-mile		Per available ton-mile	
		Revenues	Expenses	Revenues	Expenses
1950	1st	56.02	53.32	29.81	28.37
	2nd	55.20	52.26	29.58	28.01
	3rd	54.27	50.32	30.03	27.85
	4th	54.08	47.91	30.94	27.41
1951	1st	53.83	45.62	31.93	27.06
	2nd	53.59	45.08	32.40	27.26
	3rd	54.18	45.40	32.84	27.52
	4th	54.24	45.87	33.11	27.99
1952	1st	54.03	47.00	32.47	28.25
	2nd	54.21	47.44	32.31	28.28
	3rd	53.98	47.41	31.96	28.07
	4th	53.80	47.61	31.70	28.06
1953	1st	53.75	47.45	31.68	27.97
	2nd	53.62	47.32	31.46	27.76
	3rd	53.24	47.55	30.85	27.56
	4th	52.96	48.09	30.10	27.33
1954	1st	53.29	48.89	29.82	27.29
	2nd	53.13	48.91	29.42	27.09
	3rd	52.92	48.54	30.28	27.77
	4th*	52.7	48.3	29.4	27.0

*Estimated.

Source: CAB recurrent reports.

Consumer Prices Vs. Airline Receipts

	Consumer's Prices 1935-1939 Equals 100	Airline Average Receipts 1938 Equals 100	Airline Average Salaries 1938 Equals 100
1938	100.8	100.0	100.0
1940	100.2	97.8	98.4
1945	128.6	95.6	116.2
1950	171.2	107.1	184.3
1951	185.9	108.1	192.4
1952	188.4	106.9	205.9
1953	192.6	104.8	219.2
1954*	192.2	103.5	228.0

* Estimated.

Sources: Consumer price index from Bureau of Labor Statistics, airline average receipts from CAA Statistical Handbook, airline average salaries—1947-53 from Form 41
1938-47 annual airline statistics, CAB.

startled at this latter point and asked Johnson how much of a percentage increase it indicated. He refrained from further questions on the subject when Johnson informed him that it meant more than a 1,500% jump.

▶ **Traffic Delay Expense**—Johnson cited another expense item, that of air traffic delays. He told the Board that ATA surveyed 26 control centers operated by CAA. At only eight of these, flight delays of 10 min. or longer totaled 4,852 hr. 44 min. during the year July 30, 1953 to June 30, 1954.

Based on the direct operating expenses alone, arrival delays at the eight centers cost the airlines $742,000.

The ATA chief termed this particularly important, since "immediately you run into the capital expenditures necessary to provide for more effective electronic equipment. . . ."

▶ **'Staggering' Costs**—"Looking summarily at some of these factors," he said, "the annual report of one of the major airlines discloses wage rate increases alone of an added $5 million in 1953 expense. Gasoline prices increased during that year by $1.1 million. Depreciation rose $4.2 million. Training costs to introduce a comparatively smaller aircraft, the Convair, were $776,000.

"Those are the kind of costs we have been running into.

". . . We are not going to stop re-equipping. We are going to press forward, and we expect that gadgets will get more and more expensive. But we also recognize that when the airline fleet will total 1,300 planes domestically this year and with additional major introductions of aircraft, such as one airline purchasing 25 DC-7s, we run into costs which are staggering in total in the introduction of each such item."

▶ **60% Increase**—Johnson then referred to airborne electronic equipment as still another illustration of rising expense items. He pointed out that in 1946 it cost $10,000 to install airborne electronic equipment in one aircraft. The equipment consisted of five units and weighed 270 lb.

"By 1950, we experienced a 60% rise in cost to $16,000 and a parallel rise in number of units to nine, plus an 80% jump in weight. In 1954, we are at $33,000 for cost—double what it was four years ago—up to 12 units and up to 583 lb."

The ATA president said this equipment cost is exclusive of directional and radar equipment now required or ultimately needed. He added that estimates for 1958 indicate airborne electronic equipment per aircraft will cost more than $80,000, consist of 18 units and weigh over 753 lb. "Again, that is the kind of growth in expenses we are running into."

▶ **Investor Interest**—The last part of Johnson's presentation was devoted to the problem of airline industry's inability to attract healthy investment from private and institutional sources. Again, he attributed this problem to the static fare level. He previously had covered this subject in a talk before the New York Society of Security Analysts (AVIATION WEEK Nov. 22, p. 88).

"What we really need," he told the Board, "is to achieve earnings stability, build adequate financial reserves and pay regular, adequate dividends.

". . . If the financial world ever comes to seriously question the ability of the industry to attract new capital or to regularly earn sufficient funds to protect and pay for that capital, the industry's growth will be seriously impaired. It will be precluded from attaining the level of growth which presently appears possible on the horizon."

Johnson told the Board that to allow airlines to develop fully all the potentials in the industry, they must have a regulatory climate or environment and a legislative one that will allow management to consolidate the gains of recent years and to build an earnings base—"a stable earnings base."

He said this is a mandatory prerequisite to achieving the financial reserves required to attract sufficient capital to enable management to realize the bright future of the airline industry.

Nonsked Opens 'Last Ditch' Fight

North American says CAB counsel uses 'vituperative attack' and 'procedural maneuvering' to oust airline.

North American Airlines still is fighting hard for its life. With its position weakening steadily in the face of lawsuits and strong political pressure, the leading nonsked's offensive tactics are getting stronger. In what some scheduled airline officials call a "last-ditch stand," it is going down swinging hard.

Last week the irregular needled domestic trunklines with introduction of 102-seat DC-6B nonstop transcontinent coach service (AVIATION WEEK Dec. 13, p. 15). Earlier, it announced a $1-million advertising budget for next year.

▶ **Scheduled Flights**—North American makes no secret of the fact that it is an unscheduled airline in name only. Its new DC-6B schedule calls for scheduled daily nonstop eastbound departures from Los Angeles and westbound departures from New York, with a stop at Chicago.

Douglas, with an eye on its relationships with the scheduled airlines, took no part in the publicity connected with the delivery of the new ship to North American.

The 102-seat design was attracting considerable interest at Douglas, however. Seating was standard coach-type configuration with three forward-facing seats on one side of the center aisle and two on the other.

A spokesman for North American says it may alter the DC-6B later to a rearward configuration.

▶ **Reversed Sequence**—Meanwhile, the nonsked is attacking the counsel for Civil Aeronautics Board in its latest offensive maneuver. Counsel had asked the Board to consider the enforcement case against NAA before taking up the carrier's application in the New York-Chicago service case for permission to operate certificated coach service between the two cities.

North American contends that "propagandist methods" have been used and claims CAB examiner William F. Cusick has reversed the proper sequence of the two cases in the "zeal" to put the nonsked out of business.

▶ **'Killing Us Off'**—NAA spokesman Stanley Weiss says: "The vituperative attack on North American Airlines by counsel for CAB is irrelevant and completely avoids the issues. In effect, the Board's attorneys admit that we are entitled to proper procedure, but they oppose it anyway. . . .

"Procedural maneuvering is one method of killing us off in an industry where monopoly has been so dominant that no new company has ever been granted a certificate to service a major trunk route in the history of the Board.

"Now that Board's counsel finds that

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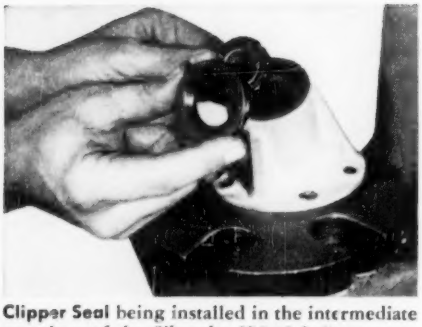

Clipper Seal being installed in the intermediate gear box of the Sikorsky HO5S helicopter to seal oil in, keep abrasives out.

Photograph and cross section of Type LPD Clipper Seal. This is just one of numerous styles available to solve tough sealing problems.

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To retain the lubricants vital to its complex rotor and gear systems . . . and to protect bearings against the infiltration of abrasives . . . the new Sikorsky HO5S helicopter depends on these positive sealing qualities of Johns-Manville Clipper Seals.

Clipper Seals are flexible—molded of special compounds, they have a tough, dense heel and a soft flexible lip concentrically molded into one piece.

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10-Hour Nonstop

Large irregular airlines will be able to operate nonstop transcontinental service under a proposed Civil Aeronautics Board extension of the 10-hr. flight limitation to nonskeds.

The proposed rule is the same as that now applied to scheduled airlines but would specify certain communications services for safety purposes.

Scheduled airlines operate nonstop flights under a special Civil Air Regulation issued last June that extends the flight time limitation from eight to 10 hr. for pressurized aircraft carrying two pilots and a flight engineer. The special rule will terminate when final action is taken on permanent time limits.

The irregular operators must have a CAA-approved independent air-ground communications service and dispatch organization serving terminal points. Systems would be similar to those required of scheduled carriers.

Board action came as the result of a request by North American Airlines for the extension.

there is no plausible reason for not hearing our case in proper, normal order, they have taken refuge in name calling. When baseless and wild statements are made by officials who hold positions of responsibility, the public should be alerted."

▶ **Siphoning Business**—Weiss contends that in this case, counsel for CAB has tried to "create" two gross misimpressions:

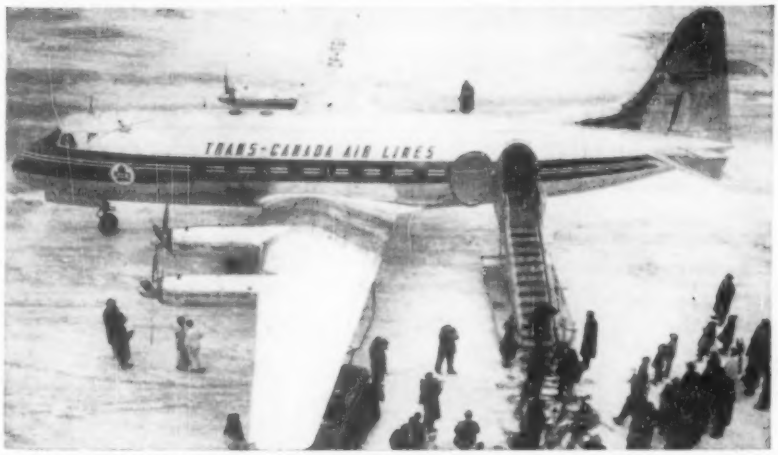
- NAA siphons traffic and revenue from other carriers.
- The nonsked carrier has made a profit.

On the first point, Weiss says the irregular airline created its own market by pioneering the aircoach field. "If there has been any diversion, it has been the siphoning of business from North American by other carriers who have adopted methods and techniques which we innovated."

Weiss contends the certificated industry has expanded 40 times since 1938. Citing the year-by-year growth, he says CAB has helped the scheduled airlines to hoard resulting traffic and revenues by protecting them from competition and guaranteeing them against loss through government subsidy.

"The charge is made that North American has made a profit," Weiss says. "It ill behooves the Board to cast dispersions on such profit when it comes not from subsidy, not from inflated and over-priced mail pay, not from U.S. Treasury, and not from overcharging the public."

He claims North American's profit last year was derived legitimately after the carrier hauled nearly 500,000 passengers "at a lower fare than any certificated carrier under CAB."



TCA'S FIRST VISCOUNT at Montreal Airport Dec. 12 after flight from Britain.

Trans-Canada Gets First Viscount

Montreal—Trans-Canada Air Lines' first Vickers Viscount arrived here last week after a trans-Atlantic flight from Prestwick with a one-day stopover at Keflavik, Iceland.

With Vickers chief test pilot G. R. Bryce in the captain's seat, the turboprop made the run at an average speed of 320 mph. TCA's flight superintendant, George B. Lothian, was in the co-pilot's seat and G. R. Edwards, Vickers' managing director and chief designer of the Viscount, was among the passengers.

▶ **Schedule Setback**—The aircraft originally was scheduled for delivery about six weeks ago, but numerous Trans-Canada modifications took longer than expected. The second aircraft is slated to arrive in early January, with the remainder of the 22-plane fleet arriving at two-week intervals. TCA expects to have 14 by early May.

The delay in delivery has set back the schedule for beginning of actual flight operations, according to TCA officials. Initial service, Montreal-Toronto-Winnipeg, now will begin in late February. Toronto-New York service is scheduled to begin the end of next March.

TCA still will be the first airline to bring Viscount service to the U.S., however, since Capital Airlines is not scheduled to receive its first aircraft until spring (AVIATION WEEK Dec. 13, p. 103).

▶ **Service, Flight Training**—The Canadian carrier soon will fly its first Viscount to the main maintenance base at Winnipeg, where it will be used to give service personnel experience on production engines. Up to now, they have been working with training models.

TCA's pilot schooling program calls for training of 40 two-man Viscount crews at Montreal and Toronto bases. Majority of crews will be based at Toronto for services to Winnipeg, Chicago, Cleveland, New York and Montreal.

The overall training program will total about 800 hr. It starts Jan. 3 and is expected to be about five months until all crews are checked out on the aircraft.

Airlines Back U.S. Tourist Travel Plan

Tourist development program to promote travel to South America, proposed by the U. S. at the recent meeting of the Inter-American Economic and Social Counsel in Rio de Janeiro, has the enthusiastic backing of Air Transport Assn.

ATA president Earl Johnson says steps recommended by the U. S. at the meeting included "the establishment of tourist promotion offices in some major U. S. cities, provision of adequate advertising budgets and construction of hotels in key Latin American tourist areas and the elimination of unnecessary documentary requirements."

Air France—Pay Plan

Air France is entering pay-later air travel with a "Traveloan Plan," offered in conjunction with the Chemical Corn Exchange Bank of New York. No down payment is required, and terms are available for 12, 15, 18 or 24 months. The plan will operate only in New York at first, but the French airline eventually expects to include all of the United States and Canada.

Macklin Spells Out Airlines Defense Role

Major role of the airlines in any future national emergency will be to tap the "common stockpile"—the entire productive capacity of the U.S.—and deliver defense supplies to trouble spots, Frank J. Macklin, director of Air Transport Assn.'s military bureau, says.

He adds that the emergency potential of the scheduled airlines is in direct ratio to the continuing growth of their peacetime fleets.

▶**Airline Future**—Macklin is confident of airline growth, and he makes the following predictions:

- By the end of 1954, scheduled airlines will have flown 34 million passengers 19 billion passenger-miles.
- In 1965, airlines will be carrying about 87 million passengers, more than half the population of the U.S., approximately 27 billion passenger-miles.
- Airlines should be carrying about 229 million ton-miles of mail by 1965, an increase of 138% over 1953, and about 581 million ton-miles of cargo, a gain of 124% over 1953.
- By the end of this year, seven out of every 10 first-class travelers in the U.S. will be using the airlines.

Macklin says that by the late 1950s pure jet transports should be operating on some longhaul transoceanic schedules and, later, on transcontinental runs.

▶**Stable Base**—The ATA official says the "on-again off-again" process of the development of a mobilization base appears to be over.

"It appears that we are now beginning to realize that the business of security—of mobilization—should be given just as constant and stable a place as other businesses in the national economy.

"Under current mobilization planning, the scheduled airlines have earmarked 331 of their four-engine aircraft to support the military airlift in an emergency. . . . More than 200 of these planes have undergone modification to make them adaptable for military use on 48-hr. notice. In addition to this standby fleet, . . . the scheduled airlines' remaining aircraft of approximately 1,000 are available for defense purposes. . . ."

Railroads Lose Round In Mail-by-Air Battle

The railroads lost the first round of their legal campaign against the surface-mail-by-air program last week when a federal judge rejected their request for a temporary injunction to halt the West Coast experiment (AVIATION WEEK Dec. 13, p. 18).

In denying the request, District Judge Alexander Holtzoff found that public interest factors of service outweighed any railroad losses.

The legal questions involved in the suit still are to be answered. No time has been set for hearings, but the railroads may take action to have the case heard by the end of next month.

▶**Delivery Speedup**—Meanwhile, Postmaster General Arthur E. Summerfield announced the West Coast experiment has advanced mail delivery as much as 48 hr. in the first two weeks of operation.

Summerfield stated that "information received here daily by the department relative to the 3-cent mail-by-air experiment on the Pacific Coast shows that much business mail is being advanced 24 hr. in delivery and in some cases 48 hr." He said, "Deliveries of residential mail, on the basis of samplings, show similar advances in most instances."

▶**21,000 Tons Yearly**—The first-class-by-air program also is proving successful in the East, according to Summerfield. He said the initiation of the West Coast airlift rounds out the experiment on a nation-wide basis.

The Post Office Department estimates the West Coast operation will carry about 8,000 tons of first-class mail annually. Mail is being flown on other segments of the project at the rate of 13,000 tons a year.

The combined East-West operations will be carrying about 7½% of out-of-town 3-cent mail.

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CAB ORDERS

(Dec. 2-8)

GRANTED:

Resort Airlines' application for a temporary exemption to transport military personnel on furlough within the United States.

Wien Alaska Airlines' application for an extension of its exemption to operate between Ft. Yukon and Arctic Village, Alaska, until final CAB decision is reached in the intra-Alaska air service case.

West Indies Airways' application for an extension of its temporary exemption to serve various Caribbean points from San Juan, P. R., for one year or until 30 days after a decision is reached in a case involving a certificate for any of the specified routes.

APPROVED:

Intercompany agreements involving Capital Airlines and Trans World Airlines and other carriers.

New York Airways' flight pattern inaugurating property-only service between Newark, N. J. Airport and Rutherford, N. J., and between New York's LaGuardia Airport and Rutherford.

AMENDED:

Delta C&S Air Lines' certificate to suspend Terre Haute, Ind., while Lake Central Airlines serves that point.

ORDERED:

Transocean Air Lines' fares filed for service between Newark/New York and Burlington, Vt., and Plattsburg, N. Y., suspended and an investigation of them instituted.

DENIED:

Petition by Davenport Airport Commission, city of Davenport, Iowa, and its chamber of commerce and Scott County, Iowa, board of supervisors for reconsideration of a Board order denying an earlier petition for consolidation of certain dockets.

Eastern Air Lines' petition for reconsideration in the Eastern-Colonial control case. The petition concerned certain changes in language in CAB findings and in request of expedited action. The Board finds the specified language is amply substantiated and that action already is under way.

DISMISSED:

Investigation of a Western Air Lines fare increase, since the fares have been canceled.

SHORTLINES

▶ **Air Express Division** of Railway Express Agency has inaugurated scheduled service to Passaic and Paterson, N. J., in New York Airways helicopters, linking that area directly with the air express network. NYA will use New Jersey heliport No. 1 in Rutherford, N. J., as a terminal for the service.

▶ **Flying Tiger Line's** domestic freight revenues for November increased 5% over the same month last year. Traffic revenue totaled $502,000.

▶ **International Air Transport Assn.'s** clearing house reports September business of $28,850,000 set a new monthly record and was 20.8% higher than the turnover recorded in September 1953. Clearances for the first nine months of 1954 reached $210,567,000, an increase of 18.3% over last year.

▶ **Southern Airways** reports record increases in passenger traffic during November. Southern carried 12,119 passengers and flew 2,044,000 passenger-miles, increases of 35.1% and 34.3% respectively. Load factor of 39.2% also set a company record.

▶ **Trans World Airlines** plans a year-long, world-wide celebration in 1955 to mark its 30th year of operation.

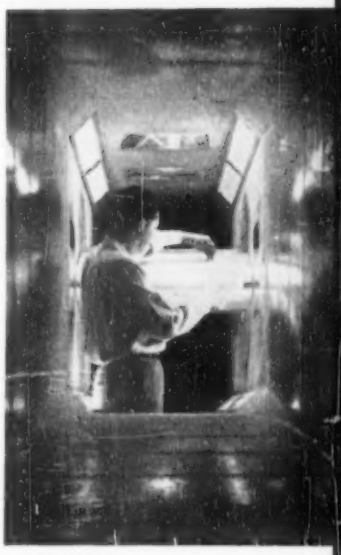
▶ **United Air Lines** will inaugurate DC-7 service between Pacific Northwest, Midwest and East next month. Seattle/Tacoma-New York service will be offered on a 9½ hr. schedule.

Carl Vrooman, icing tunnel group head, studies hot-air cyclic de-icing test on wing section of C-130 transport. The tunnel has a temperature range of −40° F. to +150° F. and maximum air speed of more than 270 mph.

New icing tunnel speeds thermodynamics research at Lockheed

Designed to meet a constantly increasing volume of thermodynamics work, Lockheed's new icing research tunnel now provides year 'round testing in meteorological environments normally found only in flight. It is the first icing research tunnel in private industry.

Lockheed thermodynamics scientists are now able to study in greater detail problems such as: thermal anti-icing; cyclic de-icing; various methods of ice removal; distribution of ice; rate of temperature changes in aircraft components; thermodynamic correlation between laboratory and flight testing; and development and calibration of special instrumentation.



C. H. Fish, design engineer assigned to the tunnel, measures impingement limits of ice on C-130 wing section. The tunnel has refrigeration capacity of 100 tons, provides icing conditions of 0 to 4 grams per cubic meter, droplet sizes from 5 to 1000 microns.

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B. L. Messinger, department head, analyzes test results with Thermodynamics Engineer E. F. Versaw (right) and Thermodynamicist Tom Sedgwick (left).

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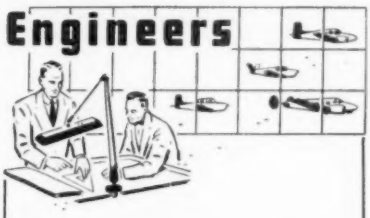

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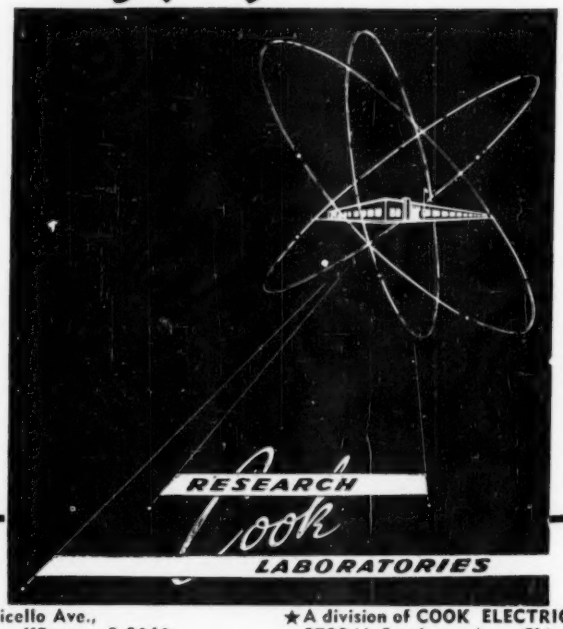

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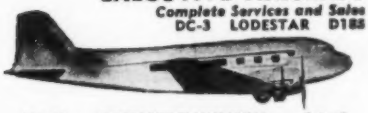

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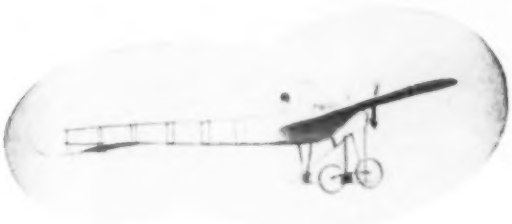

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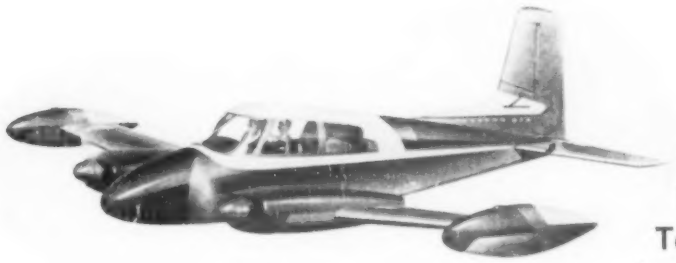

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News Sidelights

Lockheed's answer to American Airlines' demand for a turboprop transport with shorter range than its L-1449 Super Constellation is expected to be a completely new design, somewhat similar to the Vickers Viscount. Observers expect Convair to come up with an oversized four-engine 340, while Douglas offers an undersize DC-6 in the so-called "C. R. Smith competition."

Air Force is opposing U. S. Cement Corp.'s plan to put up a new plant near March AFB, Riverside, Calif. Reason: Dust from the plant may produce serious flying hazards on the approaches to the Strategic Air Command base, it says. Brig. Gen. Charles Westover, Commander of SAC's 12th Air Division, says visibility in the area has declined steadily in the past 10 years and further deterioration must be prevented if possible.

Government contract for design of a long-and-short-range radar air traffic control center for the U.S. Naval Air Station, Miramar, Calif., has been awarded to Adrian Wilson & Associates, Los Angeles. Project's construction cost is estimated at $400,000.

Ninth annual Powder Puff Derby, the 1955 all-woman transcontinental air race from Long Beach, Calif., to Springfield, Mass., will be the longest yet—2,787 mi. Route will include Phoenix, Tucson, El Paso, Midland, Wichita Falls, Tulsa, Springfield, St. Louis, Terre Haute, Dayton, Wheeling and Reading. Chairman is Betty Gillies.

Second version of Flyride Helicopter, this one featuring a conventional control system, was shown for first time at Helicopter Forum, Wings Field, Pa. New model was designed because company received heavy mail asking for standard-control version, says maker, Glenview Metal Products Co., Delanco, N. J. Earlier Model R has single control stick.

To avoid recurrence of an incident at Greater Pittsburgh Airport last August, when 77 passengers were not permitted to leave a trans-Atlantic plane that had been diverted there during Hurricane Edna, airport officials have set aside two rooms in the terminal for use by "quarantined" international travelers. Passengers had to remain aboard the plane about three hours following 15-hr. flight from Frankfurt, Germany, because field does not have port-of-entry facilities.

ROCKET MOTORS ON ROTORTIPS of Sikorsky HRS-2 in foreground give extra power, allowing it to match takeoff performance of conventional HRS-2 in background even when carrying 650-lb. additional load in basket slung under the fuselage. Dome above main rotor on nearer copter carries hydrogen-peroxide fuel for Reaction Motors' engines (Aviation Week Sept. 27, p. 17).

AVIATION CALENDAR

Dec. 28-29—National Science Foundation, fourth Conference on Scientific Manpower, Berkeley, Calif.

Jan. 10-12—Helicopter Association of America, 7th annual meeting, Warwick Hotel, Philadelphia.

Jan. 10-14—Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Hotel Statler, Detroit.

Jan. 19-23—Miami International Aerorama, Miami (Fla.) International Airport.

Jan. 20-22—Conference on High-Speed Aeronautics, organized by the Department of Aeronautical Engineering of the Polytechnic Institute of Brooklyn, Engineering Societies Building, New York.

Jan. 24-27—American Meteorological Society, 135th national meeting, New York.

Jan. 24-27—Plant Maintenance & Engineering Show and three-day conference, International Amphitheatre, Chicago.

Jan. 24-28—Institute of the Aeronautical Sciences, 23rd annual meeting Honors Night Dinner, Hotel Astor, New York.

Jan. 27-28—Southern California Meter Assn., fourth annual Instrument Short Course, Los Angeles Harbor Junior College, Wilmington, Calif.

Jan. 31-Feb. 4—American Institute of Electrical Engineers, winter general meeting, Hotel Statler, New York.

Feb. 8-10—Society of the Plastics Industry, 10th Reinforced Plastics Division Conference, Hotel Statler, Los Angeles.

Feb. 10-11—Society of American Military Engineers, military-industrial conference on manpower, Conrad-Hilton, Chicago.

Feb. 20-22—Fourth annual Texas Agricultural Aviation Conference, A&M College of Texas, College Station, Tex.

Mar. 11—Institute of the Aeronautical Sciences, National Flight Propulsion Meeting (restricted), Hotel Carter, Cleveland.

Mar. 14-16—Society of Automotive Engineers, production meeting and forum, Netherland Plaza, Cincinnati.

Mar. 14-17—American Society of Tool Engineers, 1955 annual meeting, Shrine Auditorium, Exposition Hall, Los Angeles.

Mar. 21-24—Institute of Radio Engineers, national conference, Waldorf-Astoria Hotel and Kingsbridge Armory, New York.

Mar. 28-Apr. 1—American Society for Metals, ninth Western Metal Exposition and Congress, to include the American Welding Society's technical session on aircraft and rocketry, Pan Pacific Auditorium and Ambassador Hotel, Los Angeles.

Mar. 31-Apr. 1—Symposium on Boundary Layer Effects in Aerodynamics, Britain's National Physical Laboratory, Teddington, England.

Apr. 6-10—World Plastics Fair & Trade Exposition, National Guard Armory, Los Angeles.

Apr. 18-21—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, Hotel Statler and McAlpin Hotel, New York.

Apr. 24-28—Airport Operators Council, 1955 convention, Olympic Hotel, Seattle, Wash.

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LETTERS

Lost Plane Signals

I am much concened every time something happens such as the Northeast Airlines crash in the White Mountains.

It seems to me that over the years there have been too many crashes in which it has taken too long to locate the wrecked plane. To me this is almost inexcusable.

I would like to make the suggestion that AVIATION WEEK sponsor the idea of developing an emergency unit, to be carried by all airline planes, whether operating over land or water, which will give out a radio distress signal which can be easily identified. This would enable searching planes to pinpoint the location.

While there are certain drawbacks, such as what will cause the signal to go off and what will supply power over a sufficient time to enable searchers to locate the source of the signal, I believe that I can come up with positive ideas even there.

First I would like to point out the fact that if such a signal is set off, it would immediately alert those in charge of operations that a plane had crashed. This in turn would start rescue operations at a much earlier time.

I believe that the battery people can furnish a battery (dry) loaded with a battery acid capsule which would rupture under such a severe jolt as a crash and it in turn would energize the battery and the signal would go on the air. This is standard practice in the radio proximity fuse. The battery could be of sufficient capacity to operate a signal audible for 50 miles or better for a period of 12 to 24 hours. The container could be made crash proof.

ROBERT C. CODMAN
Conol Sales Co.
646 Chestnut Street
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DC-3 Engines

In the Nov. 1 issue of AVIATION WEEK, you published a report on the engine operation and maintenance form ("R2000s Give DC-3 34-mph. Boost," by George L. Christian) sponsored by Airwork and Pratt & Whitney Aircraft, which dealt in particular with R2000-D5 engine installation in DC-3 aircraft.

After reading this article carefully and with great interest, I have come to the conclusion that either the report published, or the forum itself fell short of realistically discussing the range of powerplants available for substitution for the conventional Pratt & Whitney R1830-92 in DC-3 aircraft.

I make this statement because, judging from the report published, an operator who attended the forum might very possibly have left the forum under the impression that the only satisfactory and effective solution for greater DC-3 performance is by installing R2000 engines.

Whether judging from speed, performance, safety or expense, this is just not so, and I hope AVIATION WEEK will publish this letter so that all DC-3 operators will have the actual and complete facts regarding the powerplant alternatives available to them.

I refer particularly to the Pratt & Whitney R1830-94 which was referred to incorrectly in the fourth paragraph of the account published as a -95 version of the 1830. This fine powerplant was apparently virtually ignored during the discussions that took place.

To indicate the full excellence of this engine, I would like to compare the chief objectives of the R2000 installation with the merits of installing R1830-94 engines.

Firstly, there is the question of power. An R1830-94 engine is rated at 1,350 hp. for takeoff, 1,100 maximum hp. except for takeoff, and 780 maximum cruise hp. (These facts are borne out by Pratt & Whitney revised power curve charts and operating instructions.)

Thus R1839-94's develop and are rated for METO and cruise horsepowers equal to R2000-D5 engines in DC-3 use.

This, in turn, means that a DC-3 equipped with R1830-94 engines also easily achieves cruising speeds of 200 mph. and over, and that cruising speeds such as 214 mph. are well within daily operating reach as many operators can testify. In addition, the R1830-94 installation also permits an allowable takeoff and landing gross weight of 26,900 lb.

One or two other points deserve mention. Some operators do not realize that the R-1830-94 is also a completely proven engine with a wealth of experience behind it.

The Navy has operated thousands of R-1830-94's in PB4Y2 Privateers since 1943. This aircraft is still doing its job for the Navy and Coast Guard throughout the world, 10 years after its first flight, and they have been operated and are operated today at gross loading identical with the loads carried on DC-4's.

Regarding commercial operation, we ourselves assisted Superior Oil Co. and Lockhart Oil Co. in 1950 to receive the first and original commercial certification for R1830-94's in DC-3's and Lockheed Lodestars. Since then, we have supplied an ever increasing number of executive operators with R-1830-94's and we have accumulated a considerable and extremely satisfying commercial operations information file on their use.

In addition, we have accumulated an equally useful R1830-94 overhaul and modifications experience in our shops, through which operators are assured of a long-term source of R1830-94 supply.

The final point I would like to thump is that of cost.

New R2000-D5's sell for approximately $33,000 each. Thus, without providing for spare engines, an operator converting his DC-3 to R2000's is faced with a cash outlay of approximately $100,000 to cover the engines he buys, and the expensive aircraft modifications he is required to accomplish in order to install them in his DC-3.

New R1830-94's are available on the market for approximately $10,000 each brought to late specifications, and no expensive aircraft modifications whatever are required to permit their installation.

And at this substantial savings, the operator gets an engine whose true excellence is indicated again in that it develops 975 METO hp. at 15,000 ft. in high blower (R1830-75's or R2000-D5's have no high blower), whereas those R2000's presently installed in DC-3's develop only 925 METO hp. at the same altitude. This explains why an R1830-94 equipped DC-3 recently easily climbed to and held 15,000 feet of altitude at maximum gross aircraft weight with one -94 feathered. And this is an indication of the margin of greater power and safety available to DC-3 operators with this excellent Pratt & Whitney powerplant.

Thanks for an opportunity to fill in the picture more completely on DC-3 powerplant alternatives.

With best regards to AVIATION WEEK,

F. H. STEWARD, President
Steward-Davis, Inc.
13501 South Western
Gardena, Calif.

Big Texas Airport

Is this airport at Fort Worth (AVIATION WEEK Nov. 29, p. 77) really 1,828,000 acres, or was this article "especially for Texans"?

ORA E. GAINES
113 62 Street North
Birmingham 6, Alabama

(Apparently the proofreader is from Texas. The correct acreage for the Ft. Worth airport is 1,828 which was the figure in the story before the printer got hold of it.—Ed).

Praise

Your article on Operation Pogo, "Missile-Fired Chute is AA Target", by David A. Anderton, which appeared in the Nov. 15 issue of AVIATION WEEK was well written and may be cited as a fine example of factual reporting.

My personal copy of this issue has long since become the property of the project and I should, therefore, like an extra copy of this particular issue.

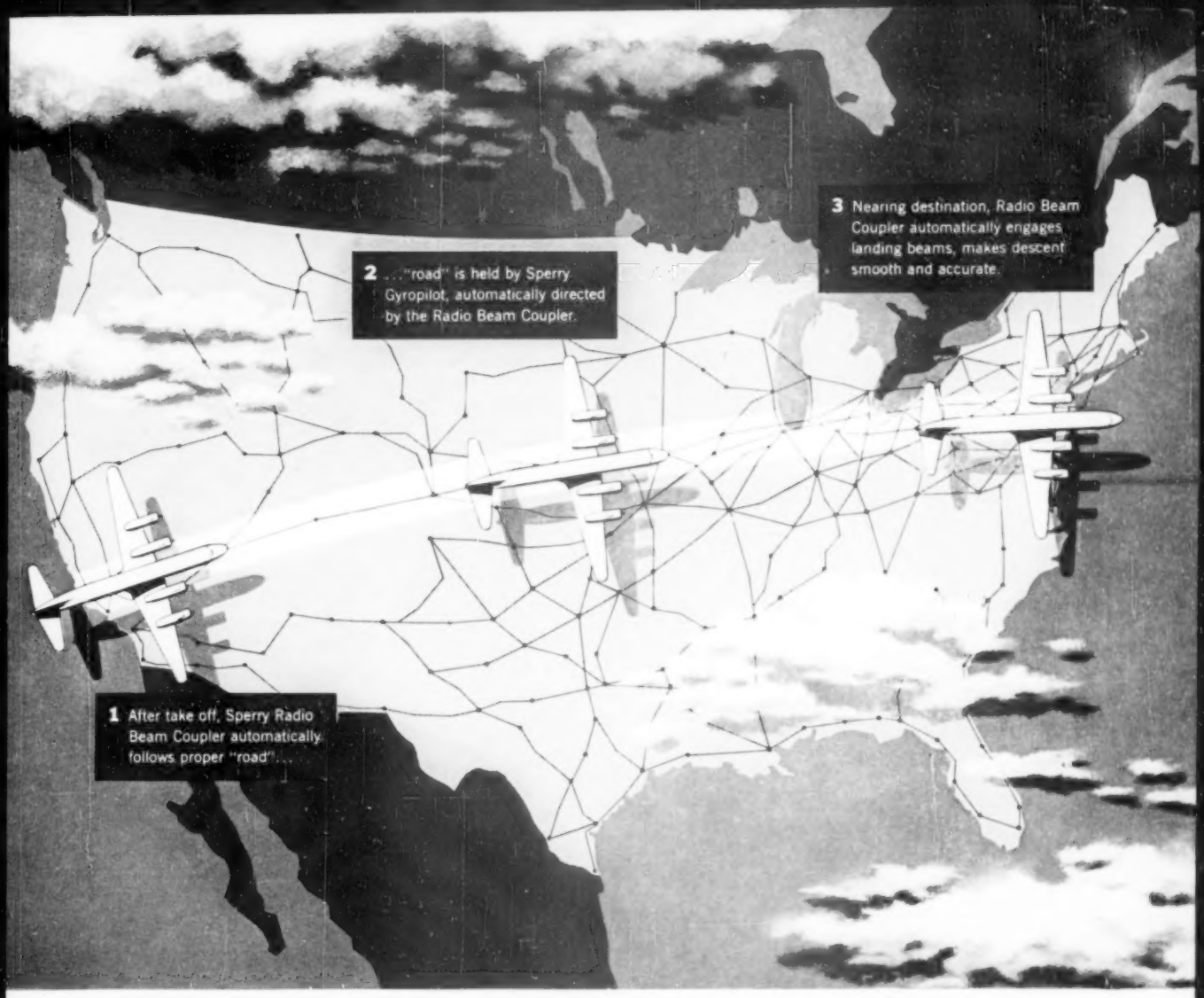
REINHOLD V. GAERTNER
Junior Physicist
New Mexico College of Agriculture and Mechanic Arts
State College, New Mexico

Gunnery Trainer

In the News Digest section of your Nov. 15 issue you stated that Rheem Manufacturing Co. and the Air Research and Development Command had developed the F-86D flight simulator as a fixed-gunnery trainer. This is slightly misleading.

Actually, a fixed-gunnery trainer has been developed. The prototype uses an F-86D flight simulator as a flight platform. Other types of flight simulators can be used as flight platforms if desired.

ANTHONY J. PERNA
Colonel, USAF
Chief, Special Training Devices Div.
D/Personnel Procurement & Training, DCS/P
Washington, D. C.


1 After take off, Sperry Radio Beam Coupler automatically follows proper "road"...
2 ..."road" is held by Sperry Gyropilot, automatically directed by the Radio Beam Coupler.
3 Nearing destination, Radio Beam Coupler automatically engages landing beams, makes descent smooth and accurate.

NATION'S "SKY ROADS" NEARING 70,000 MILE MARK

Extension of Radio Ranges Offers Airlines Faster Schedules; Passengers Greater Comfort

THE STORY BEHIND THE STORY:

■ Before long, you'll read headlines like the one above announcing the completion of one phase of a nationwide federal system of aerial "highways." Already 61,950 miles of these radio routes are in daily use or ready to use – and while you'll never see the broad "lanes," "ramps" and accurate "signposts" designed for your protection, they're just as real as on your favorite turnpike.

■ To utilize the full value of these aerial highways, more and more airliners are being equipped with two Sperry developments . . . the A-12 Gyropilot* Flight Control and the new Radio Beam Coupler which employ these high frequency radio signals in actual guidance of the plane. It's a combination that can't be equaled. En route, the plane rides smoothly on an accurate course, unaffected by cross winds or drift. In landing, the *human* pilot has the assistance of a tireless *electronic* pilot that automatically engages the localizer and landing beams to bring the plane accurately down to the runway.

■ For more than 40 years, military and commercial aviation has depended on Sperry to originate, develop and manufacture the finest in flight instrumentation and controls. The A-12 Gyropilot and Radio Beam Coupler are typical of many Sperry developments that make modern flights safe, dependable and comfortable.

* [illegible]

SPERRY GYROSCOPE COMPANY

[illegible] OF THE SPERRY CORPORATION • GREAT NECK, N. Y.

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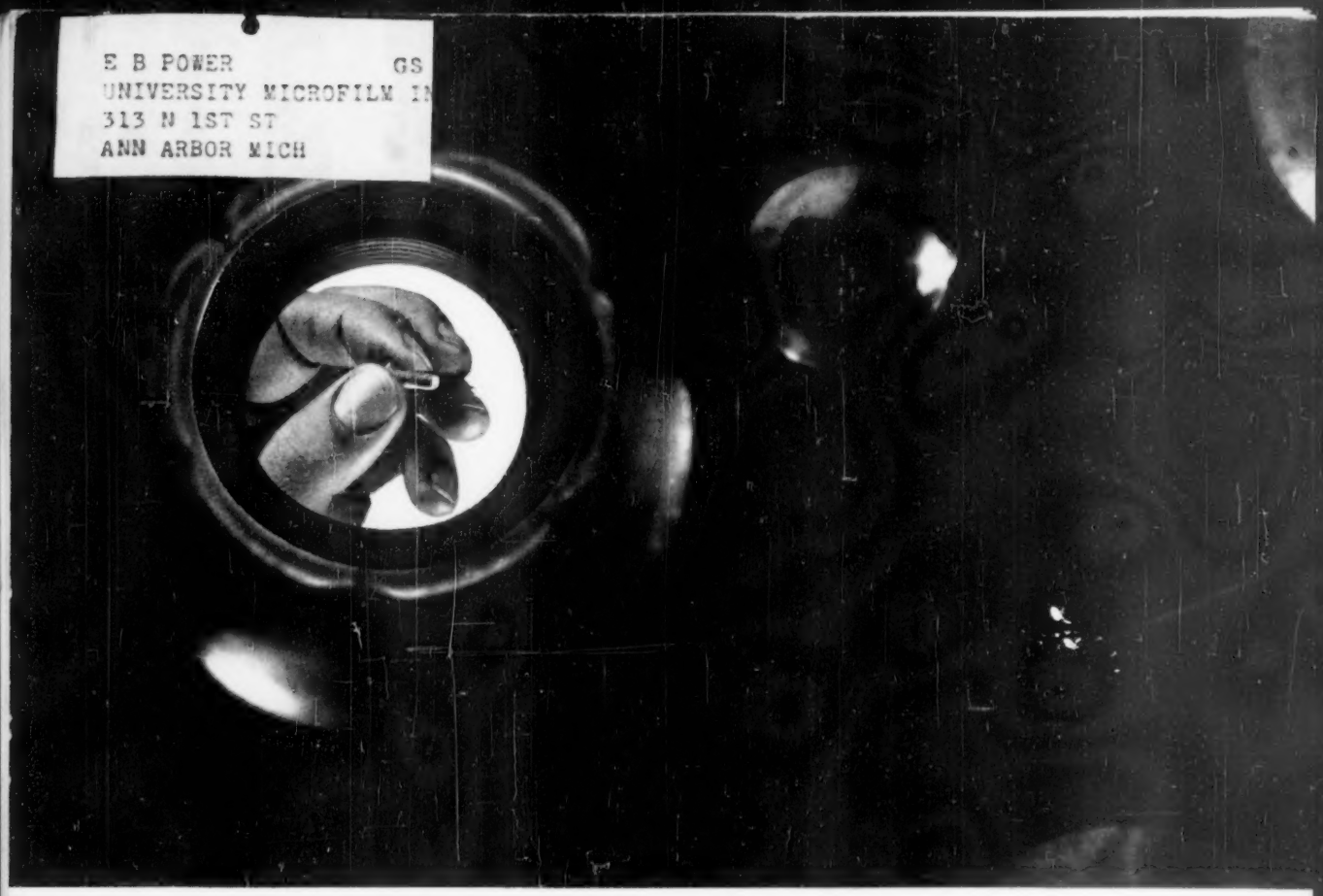

Inside look at a safe overhaul!

NOW resilient Nylon inserts guarantee even better performance and extra reusability on all ESNA "blind" fasteners

ELASTIC STOP® nuts are specified for their proven self-locking, vibration-proof characteristics. But—air frames must also be designed with simple disassembly and economical overhaul in mind. And fixed fasteners must provide a safe margin of locking torque even though re-used again and again. Nylon inserts won't wear out. Bolt threads enter smoothly into the plastic locking collar, guaranteeing the narrow range of torque "scatter" ideal for power-tooled assembly lines. And for re-assembly any AN quality bolt can be used interchangeably . . . safely . . . when ESNA nylon inserts are on the "blind" fastener. The result . . . safer, simpler, low-cost maintenance procedures.

Nylon insert Elastic Stop nuts also provide:

- **immediate identification during production or in the field.**
- **positive thread sealing and vibration-proof resistance to loosening.**
- **non-galling locking action that protects bolt threads against stripping and seizure.**
- **inertness to most common organic chemicals, oils, fuels and fungus growths.**
- **locking device adaptability to special aircraft fastener design requirements and productibility through a wide size range from 0-80 to over 2".**

ELASTIC STOP NUT CORPORATION OF AMERICA

Rigid Anchor Nuts

Floating Anchor Nuts

Gang Channel Nuts

Mail coupon for new Nylon spec

Elastic Stop Nut Corporation of America
Dept. N-64-1225, 2330 Vauxhall Road, Union, N. J.

Please send me the following fastening information:

☐ ESNA's New Nylon Specification Sheet

☐ Here is a drawing of our product. What fastener would you suggest?

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____